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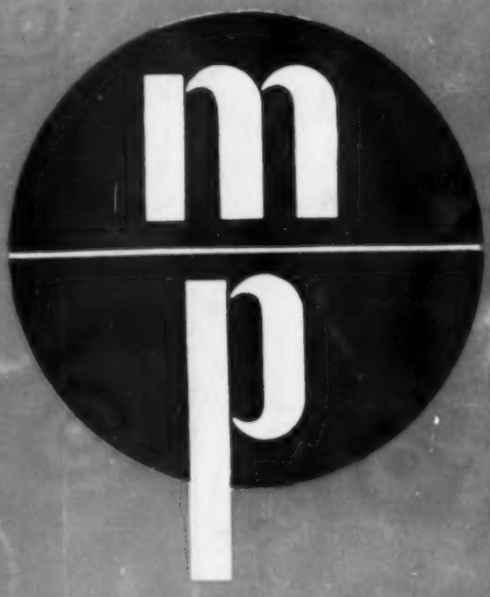
MODERN PLASTICS



MARCH 1948

JR v.25² March-Aug. 1948

FOR product engineers and designers, the unsurpassed versatility and dependable uniformity of Durez phenolic plastics offer a vast storehouse of solutions to design, structural, and production problems. An example of versatility is in impact strength. This is available in Durez compounds in a wide range to fit many applications. Emphasis on strength is obtained through manipulation in structure without undue sacrifice of heat resistance, self-insulation, surface luster, and other wanted properties.

The molded parts shown here suggest the many industrial services that *impact strength* Durez is performing. Your products may or may not require the highest degree of strength for long-life expectancy. Yet it is well to know that real ruggedness can be had with the simplicity and speed of molding.

"Durez Plastics News" can keep you advised each month of what other manufacturers are accomplishing with Durez. Let us send it to you.

USE DUREZ FOR RUGGED SERVICE AND

Durez Plastics & Chemicals, Inc., 123 Walck Road, North Tonawanda, N. Y.

Export Agents: Omni Products Corp., 460 Fourth Avenue, New York 16, N. Y.

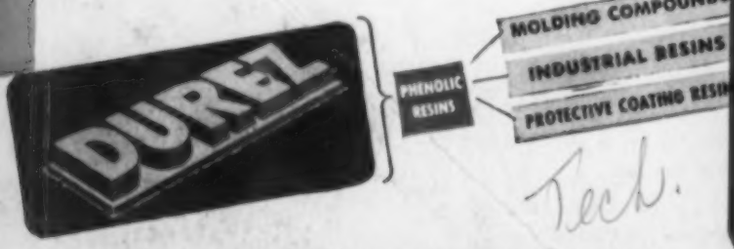
"Long-Life Expectancy"

TEXTILE MACHINE tension pulley is a molded shell of medium-impact Durez, fitted with metal shields and mounted on a deep-groove metal ball bearing. Non-corrosiveness, light weight, and moldability are desirable properties that supplement the impact resistance of Durez in textile machinery.

TIRE INSPECTOR locating head serves to spot bits of metal imbedded in rubber. Self-insulation in the material is the primary requisite. Impact-resistant Durez combines this with strength needed to withstand rough service in garages.

MAGNETO PARTS requiring metal inserts are best made of a plastic material with a flexible set that will not crack around the inserts. Measuring high in all needed properties, one of the high-impact Durez compounds is widely used in this service.

IRONER FORMING TABLE of Durez emerges from die with molded-in finish over which damp clothes will slide easily and smoothly. Impact strength of this plastic enables the table to take hard wash-day abuse. Easy moldability and dielectric properties are duplicated in the Durez thermostat dial knobs, shaft, and brackets.



Tech.

PHENOLIC PLASTICS that fit the job

"ON LOCATION"... THREE MEMBERS OF THE *Catalin* PLASTICS FAMILY

1. *Catalin Cast Phenolic*
FOUNTAIN CUP DISPENSER

2. *Catalin Molding Compound*
FOUNTAIN CUP HOLDER

3. *Catabond Liquid Resin*
FOUNTAIN COUNTER TOP

Although on many locations, several Catalin plastics serve one modern facility—it isn't often that we can catch a group picture of the family at work.

Referring, therefor, to this Soda Fountain back-bar set-up!

1. The Solo* soda and sundae cup dispenser is a straight draw, one piece richly mottled Catalin (cast phenolic) . . . produced at a minimum mold investment. Its 15½" length, 9" height and 6½" depth contribute size, strength, stateliness, solidity and sufficient stacking space . . . in a unit that promotes convenience, cleanliness and sanitation.

2. The individual soda cup holder is molded of jet black Catapak, phenolic compression molding compound . . . most desirable when low cost and quantity are factors. Catapak moldings are light weight, strong, can be safely subjected to hot water and soap suds. Were these cups to have been injection molded of polystyrene, Catalin's heat-resistant Loalin would have also met the required specifications.

3. The Panelyte** counter top is a decoratively finished and colored paper base, laminated with a clear Catabond liquid resin. Thus treated, the surface acquires a high polish, is hard, long-wearing, smooth, non-inflammable, stainproof and easy to keep clean.

To insure your pre-eminent satisfaction with Catalin plastics, consult a dependable fabricator, molder, laminator—or—feel free to draw, without obligation, upon the services of Catalin's technically experienced staff. Inquiries invited!

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

**Catalin Solo Paper Cup Dispenser, Product of Paper Container Mfg. Co., Chicago, Ill. Fabricated by Colonial Kolonite Co., Chicago, Ill.*

***Panelyte, Product of St. Regis Paper Co., N.Y.*

Insulux Glass Blocks — Courtesy Owens-Illinois

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS*

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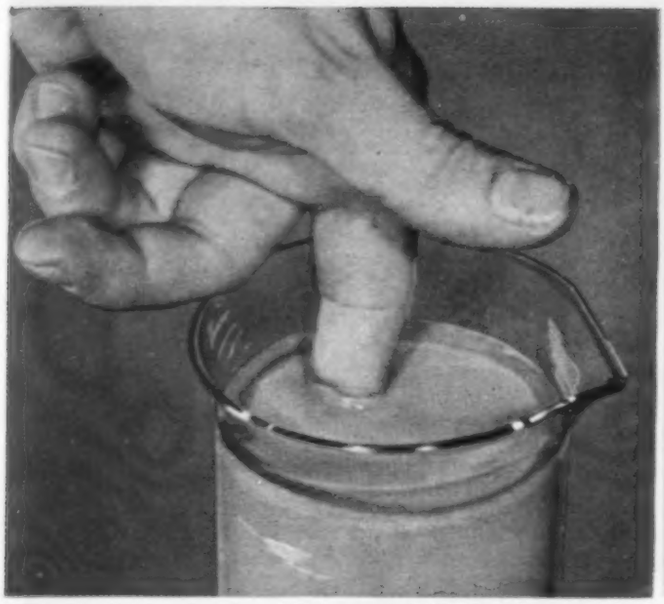
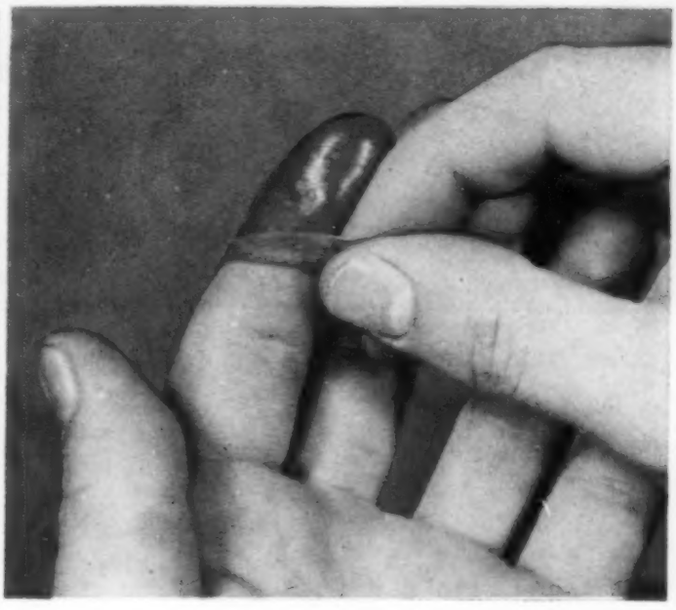
* Reg. U. S. Patent Office.



Hot air not needed

A new Geon latex film-forming at room temperatures



THE man has just dipped his finger into a new Geon water-borne resin known as Geon Latex 31X. It will dry on his finger, in the air, at ordinary room temperature, rapidly and evenly.

If you package foods or deal in fresh fruits and vegetables . . . or if you're looking for a better adhesive . . . or want to make a water paint with a water-impervious film that will dry at simple room temperature . . . or if you're dipping toys, gloves, packages, etc., where the form has a complicated shape and a thin flexible wall or covering is required—you'll want to know more about Geon Latex 31X.

The deposited film is flexible, but contains no plasticizer. It is odorless, resistant to grease, and has low moisture vapor transmission. It won't support a flame. Adheres readily to paper, wood, fiberglas, and textiles.

A distinct advance, a cost-cutter, a product-improver, you will agree—and we'll be glad to send our special bulletin giving complete details. We make no finished products from Geon Latex 31X or any of our other raw materials. We are interested, however, in any problems or special applications. For the special bulletin, please write to Department O-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

It took Chicago Molded to redesign this adding machine wheel in a way that would save the manufacturer eight assembly operations.

Sure, the wheels had been made of plastics for years, but always with a metal gear attached . . . a job that required eight assembly operations per wheel . . . 64 operations per machine.

When Reliable Adding Machine Company of Chicago brought their Addometer to us, we quickly showed them how we could mold the gear integral with the wheel . . . a simple one-piece job.

Result . . . an actual time saving of 20 minutes in the assembly of each Addometer, plus the cost of the metal gear and locking pin. And, remember, this is a substantial saving on a low cost item of this kind.

This is just another example of the practical engineering knowledge and ingenuity that is available to every CMPC customer . . . the extra ingredient over and above our recognized ability to produce the best in molded plastics. It is a service which industrial leaders have come to recognize and appreciate . . . a potent reason why so many big names in industry select CMPC as a preferred source of supply for molded plastics.

In planning your next plastics molding job, this is a fact worth remembering. We'd like to discuss this next job with you . . . at any time . . . without obligation. Phone or write.

CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave.
Chicago 51, Ill.

Representatives in principal cities

COMPRESSION *and* **INJECTION** *molding of all plastic materials*

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EDITORIAL

Plastics for Housing

There is scant evidence to indicate that the plastics industry has any coordinated plan for getting its share of the business to be obtained from the construction industry. To be sure, there are raw materials producers and processors who have entered their prize stock in this big housing field, but many of them are so frightened that someone will hear about their "secret" that they cover it with a blanket. Even those who have entered the competition with older and well established plastics are still operating in single-handed fashion.

Here are possibilities: Various estimates by both government and private agencies state that from $11,000,000,000 to $15,000,000,000 will be spent on new construction in 1948. Included in this figure are 925,000 new dwelling houses to be started in 1948. Experts say that 20,000,000 new homes will be needed by 1960. The amount of plastics that could be consumed in these homes defies definition.

Just to run through the list quickly, there are such possibilities as wall tile, wall paper, floor covering, hardware, electrical wiring and fixtures, sink and counter tops, wainscoting and baseboard, extruded moldings and trim, as well as many other finished items which employ plastics, to say nothing of structural materials such as the various sandwiches, laminates, and pressed or impregnated board-like products. Among the latter is a comparatively new development of a mixture containing 90 to 95% sawdust and 5 to 10% resin, produced on a continuous operating machine, that shows great promise of helping out in the plywood shortage. Softwood plywood alone consumed around 68,000,000 lb. of adhesives in 1947, with a 50% increase expected in plywood production in 1948.

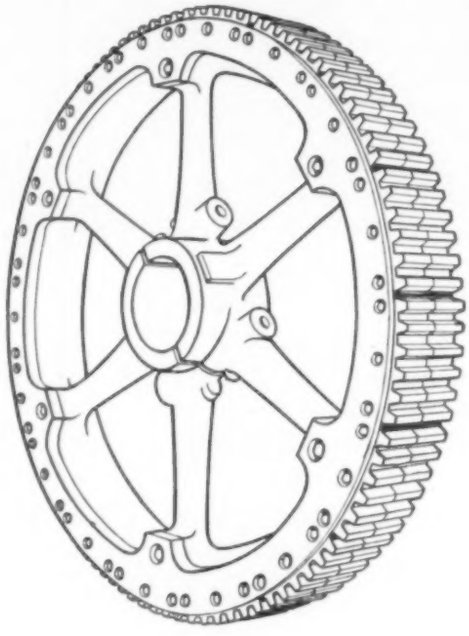
A single-handed approach towards the utilization of plastics to its greatest capabilities in the construction industry seems far from adequate. Scarcely any one manufacturer has the facilities or money to make a survey on the extensive scale needed. The business of amending building codes alone so that plastics might be used more generally is a task big enough to disturb the mind of an Einstein. No one company or person could be expected to gather together all the loose ends and find the right markets for the right plastics in this field. The situation calls for joint action. Perhaps the first thing to do would be to see that the National Research Council's proposed building research board is fully acquainted with what can be expected from plastics materials and the plastics industry.

We recommend that leaders in the plastics industry come together for the sole and avowed purpose of formulating an industry-wide policy through which the construction field may best be served by plastics.

Problems solved by Richardson...in Plastics

#6 - FABRICATION OF LARGE PLASTIC GEAR SEGMENTS.

PROBLEM: *TO REDUCE THE NOISE MADE BY A LARGE GEAR. PLASTIC GEARS WERE KNOWN TO BE FAR LESS NOISY THAN METAL ONES, BUT NO LAMINATOR HAD YET PRODUCED A GEAR BLANK LARGE ENOUGH FOR THE JOB AT HAND.*



SOLUTION: *RICHARDSON RECOMMENDED THE ASSEMBLY OF PROPERLY CONTOURED SEGMENTS WITHIN A FLANGED METAL SPIDER AND HOLDING RING. THE HOLDING RING WAS ANCHORED TO THE FLANGED SPIDER TO INSURE EQUALIZATION OF THE POWER TRANSMISSION THROUGH THE RETAINER BOLTS. RESULT:*

(1) *SILENT GEAR TRANSMITTING THE POWER REQUIRED IS NOW IN SERVICE.*

(2) *CONSIDERABLE ECONOMIES IN LAMINATED MATERIALS REQUIRED WERE EFFECTED.*

(3) *WITH THIS TYPE OF CONSTRUCTION YOU CAN NOW GET ANY SIZE OF PLASTIC GEAR YOU NEED.*

INSUROK *Precision Plastics*

INSUROK is the name of industrial laminated and molded synthetic plastic products produced by Richardson. Laminated INSUROK is available in sheets, rods, tubes, punched and machined parts, made with paper, fabric, glass, etc. Molded INSUROK products are made from Beetle, Bakelite, Plaskon, Tenite, Styron, Durez, Lucite, etc., by compression, injection and transfer molding.

The RICHARDSON COMPANY

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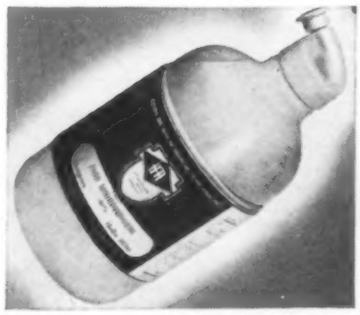
RICHARDSON MEANS *Versatility* IN PLASTICS

FEATHER-LIGHT... FITS RIGHT... IMPROVES SIGHT

New headset design employs properties of Du Pont "Lucite"



ACID EATS GLASS...
BUT NOT POLYTHENE BOTTLE

At last glass-eating hydrofluoric acid can be safely handled and stored—in a strong, durable bottle of Du Pont polythene. The light, translucent polythene bottle is tough and resilient ...unusually inert to acids, chemicals and solvents...won't shatter or break. Bottle blow-molded by Plax Corp., Hartford, Conn., for General Chemical Division, Allied Chemical & Dye Corp. Spout and cap by Injection Molding Co., Kansas City, Mo.

HERE IT IS...the latest style in telephone headsets! Created for comfort, tops in efficiency, light in weight—it's another improved product utilizing Du Pont "Lucite."

In planning this new headset design ... which allows the operator unobstructed vision ... the engineers took advantage of the dimensional stability, flexural strength, and light weight of "Lucite." Both transmitter and receiver are combined in one compact, attractive unit that moves with the head ... weighs only about six ounces.

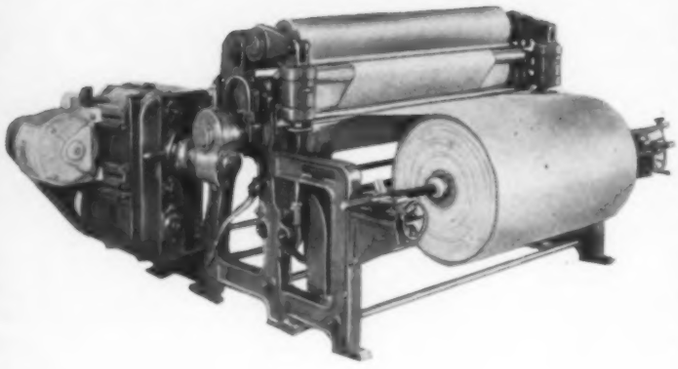
Important to both designers and manufacturers for other applications are the shatter-resistance, weather-resistance, and durability of "Lucite" acrylic resin. It's readily and economically molded or fabricated. And the beauty and clarity of "Lucite" in many colors, plus its optical qualities and ability to be edge-lighted, have improved many new products ... have given old products new sales appeal.

There may be a place for "Lucite" and other Du Pont plastics in your business. Investigate their properties and product possibilities. Write for literature. E. I. du Pont de Nemours & Co. (Inc.), Room 363, Arlington, New Jersey.

Telephone headset designed by Bell Telephone Laboratories and manufactured by Western Electric Company.

DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

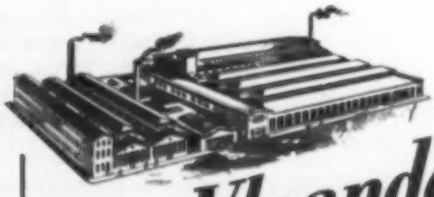
adapt this machine ⇨ to Impregnating Operations



Here's a machine that was developed by us for quetsch-pad impregnating operations in the textile industry. It can be utilized for impregnating synthetic fabrics, sheeting and film or as an impregnator in the assembly line production of low pressure, continuous laminates.

Like impregnating, there are many other operations basic to the processing of both textiles and synthetic fabrics. For many years we have manufactured a complete line of equipment for the textile industry. By checking over the full list of van Vlaanderen machines at the foot of this page, you may find the answer to one or more of the problems now confronting you in processing synthetic film, sheeting and fabrics.

Write now for information concerning the adaptability of these machines for your specific needs.



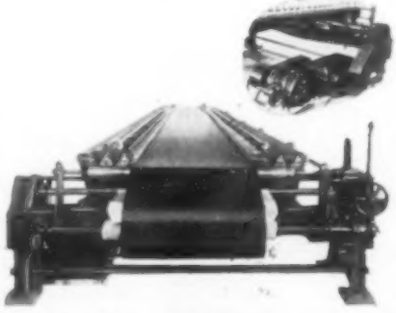
Van Vlaanderen

MACHINE COMPANY

370 Straight Street, Paterson, New Jersey

USE THESE STANDARD MACHINES FOR SYNTHETIC FABRICS

EXPANDER. Expanders are available in many different types for keeping rolls of material free of wrinkling. One or more expanders can be installed on practically all types of finishing machines to facilitate handling at take-up and let-off end of rolls.



TENTER FRAME. Tenter frames are available with or without heat units. These are excellent for stretching and orienting extruded, calendered or cast sheets or film. They can also be used on drying machines following coating operations.

BLEACHERS • BREAKERS • CALENDERS • CALENDER DRYERS CONTINUOUS WASHERS • COOLING CYLINDERS • COTTON BACK FINISHER DRYERS — ALL TYPES • DYEING MACHINES • ELECTRIC GUIDERS • EMBOSSING MACHINES • EXPANDERS • EXTRACTORS • FLOCK PRINTING MACHINES • GLASS CLOTH HANDLING EQUIPMENT • HEATING TOWERS • HYDRAULIC CALENDERS • IMPREGNATING MACHINES • MANGLES • MEASURING MACHINES • MIXING KETTLES • PAD DYEING MACHINES • PRINT WASHERS • ROLLING-UP MACHINES • ROLLS — RUBBER — PAPER • SINGEING MACHINES • SLACK PRINT WASHERS • SOAP WASHING MACHINES • SQUEEZERS • SUCTION MACHINES • TENSIONLESS CONSTANT SPEED DYE JIGS • TENTER FRAMES • TUBING MACHINES • WINDERS •

A better display at lower cost

Molded by Arrow Plastics Corp., Passaic, N. J. for The Rieser Company, Inc., New York, N. Y.

Molded of LUMARITH*

The Venida Hair Net Display is typical of the large size moldings possible with Lumarith—a Celanese *cellulose acetate* plastic.

By molding this product in Lumarith transparent plastic, the manufacturer is able to reduce to a single molding what would ordinarily be a fabricating job requiring more than two dozen parts . . . producing a better article at a fraction of the cost of other methods and materials.

If you are producing a product that you think might be made better, faster or cheaper with Lumarith molding plastics, you are invited to get in touch with a Celanese representative. He will supply you with the information and facts you need to know. Write or call CELANESE CORPORATION OF AMERICA, Plastics Division—Dept. D1, 180 Madison Avenue, New York 16, N. Y.

- ONE PIECE CONSTRUCTION—for economy
- TRANSPARENT—for quick merchandise selection
- TOUGHNESS—for long counter life

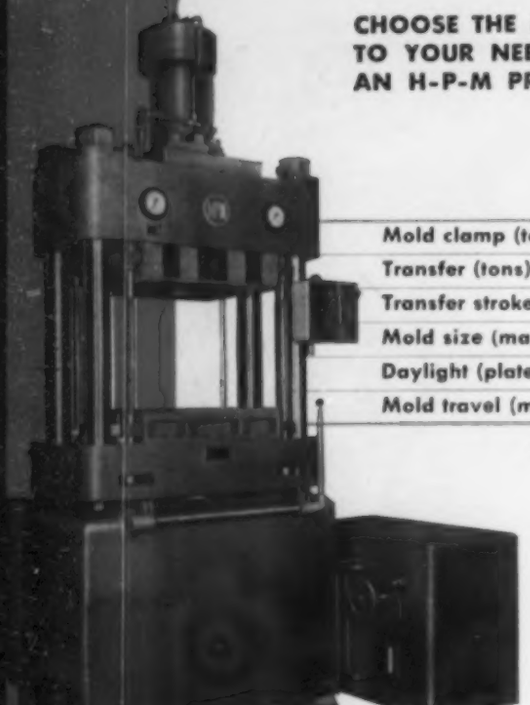
*Reg. U. S. Pat. Off.

LUMARITH* FORTICEL* CELLULOID* VIMLITE* CELCON*

Celanese* Plastics

4 WAYS TO..beat rising cost

CHOOSE THE METHOD BEST SUITED TO YOUR NEEDS . . . THEN SELECT AN H-P-M PRESS TO DO THE JOB



1 TRANSFER PRESSES

For low-cost, plunger-type transfer molding of thermo-setting plastics, H-P-M's new all-hydraulic presses do the job better . . . for less. They are especially suited for use with the most modern types of high frequency or steam preheating equipment. Operation is fast —yet under complete control. H-P-M pumps, valves and controls are designed particularly for heavy-duty press service. Semi-automatic control guarantees uniform results. Independent pressure control of both mold clamp and transfer plunger provides a wide range of application. Write for Bulletin 4702.

STOCK SIZES

Mold clamp (tons)	100	200	300
Transfer (tons)	35	50	80
Transfer stroke	12″	12″	12″
Mold size (max.)	24″ x 18″	30″ x 24″	36″ x 30″
Daylight (platen/head)	30″	36″	54″
Mold travel (max.)	15″	15″	18″

Other sizes built to order

2 INJECTION MACHINES

These advantages put H-P-M out in front in the injection molding field . . . fast plasticization with two zone, direct electric heat . . . accurate gravity-type material feed . . . positive mold sealing with all-hydraulic mold clamp. No toggles, links or cams to adjust. Exceptionally fast cycle. Quick, easy die set-up. For molding thermoplastics you can't beat H-P-M. From push buttons to radio cabinets, there's an H-P-M production unit for every requirement. Write for bulletins . . . state size.

STOCK SIZES

Capacity (oz./cycle)	4	9	16	32
Mold size (max.)	15½″x21″	16½″x24″	20″x30″	30″x41½
Mold clamp (tons)	125	250	350	750
*Daylight opening (max.)	18″	24″	32″	42″
Mold thickness (min.)	6″	12″	12″	16″
Clamp travel (max.)	12″	12″	20″	26″

*Opening between die mounting surfaces, open position.

All-Hydraulic Self-Contained

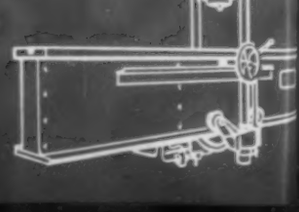
WHEREVER YOUR PRODUCTION CALLS FOR PRESSURE PROCESSING

DOUBLE ACTION DRAWING PRESSES

EXTRUDING PRESSES

OBI PRESSES

STRAIGHTENING PRESSES



st mold plastics...with H-P-M presses

acity (tons)	100	200	300
d size (max.)	24"x18"	30"x24"	36"x30"
light (platen/head)	30"	36"	54"
travel (max.)	15"	15"	18"

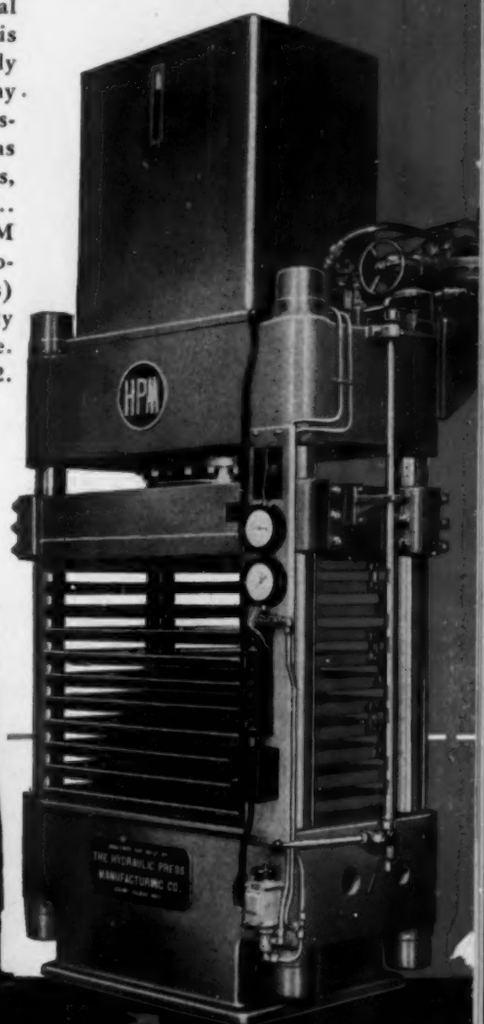
Other sizes built to order

3 COMPRESSION PRESSES

H-P-M all-hydraulic, compression molding presses have proved their ability to meet spiralling production costs of thermo-setting plastics. H-P-M's new semi-automatic production units double previous speed standards with no additional power requirements. Each press is completely self-contained...totally eliminating accumulators, lengthy pipe lines, two stage pressure systems. To the molder this means reduced floor space requirements, minimum maintenance expense... great savings in power. H-P-M engineered oil hydraulic components (pumps, valves, controls) assure undivided responsibility plus long trouble-free service. Write for H-P-M Bulletin 4702.

4 LAMINATING PRESSES

For compressing or curing laminated materials, H-P-M downward or upward acting hot plate presses are designed for maximum production output ... manual or automatic operation as desired. Platen size, daylight, ram travel, speeds are designed to meet any production requirements. Each press is completely self-contained, being equipped with H-P-M hydraulic power equipment (pumps, valves, controls). Write stating requirements.



HPM

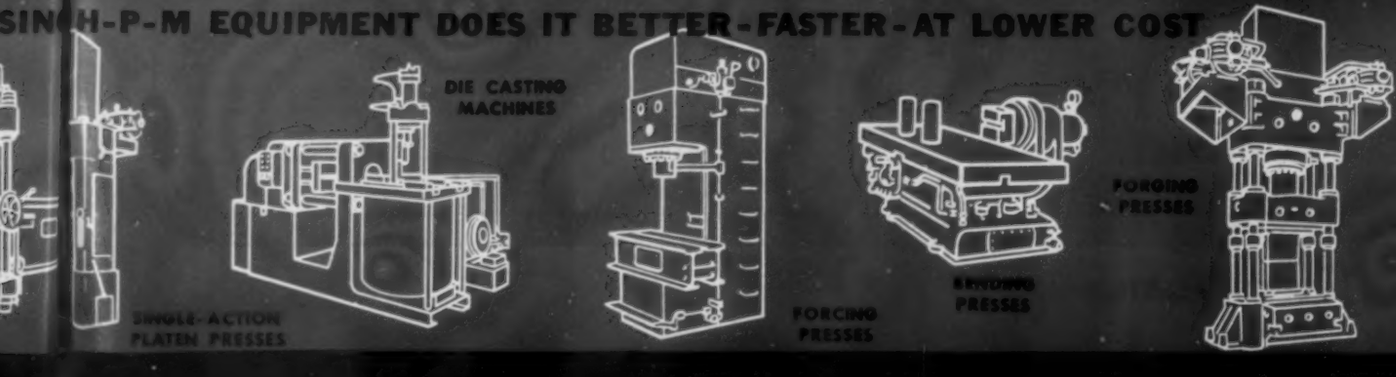
THE HYDRAULIC PRESS MFG. COMPANY

1010 Marion Road • Mt. Gilead, Ohio, U. S. A.

Branch Offices in New York, Cincinnati, Cleveland, Columbus, O., Detroit, Pittsburgh and Chicago. Representatives in other principal cities. Export Dept: 500 Fifth Ave., New York, N.Y. Cable—"Hydraulic"

ed LASTICS MOLDING PRESSES

H-P-M EQUIPMENT DOES IT BETTER-FASTER-AT LOWER COST



MOSINEE

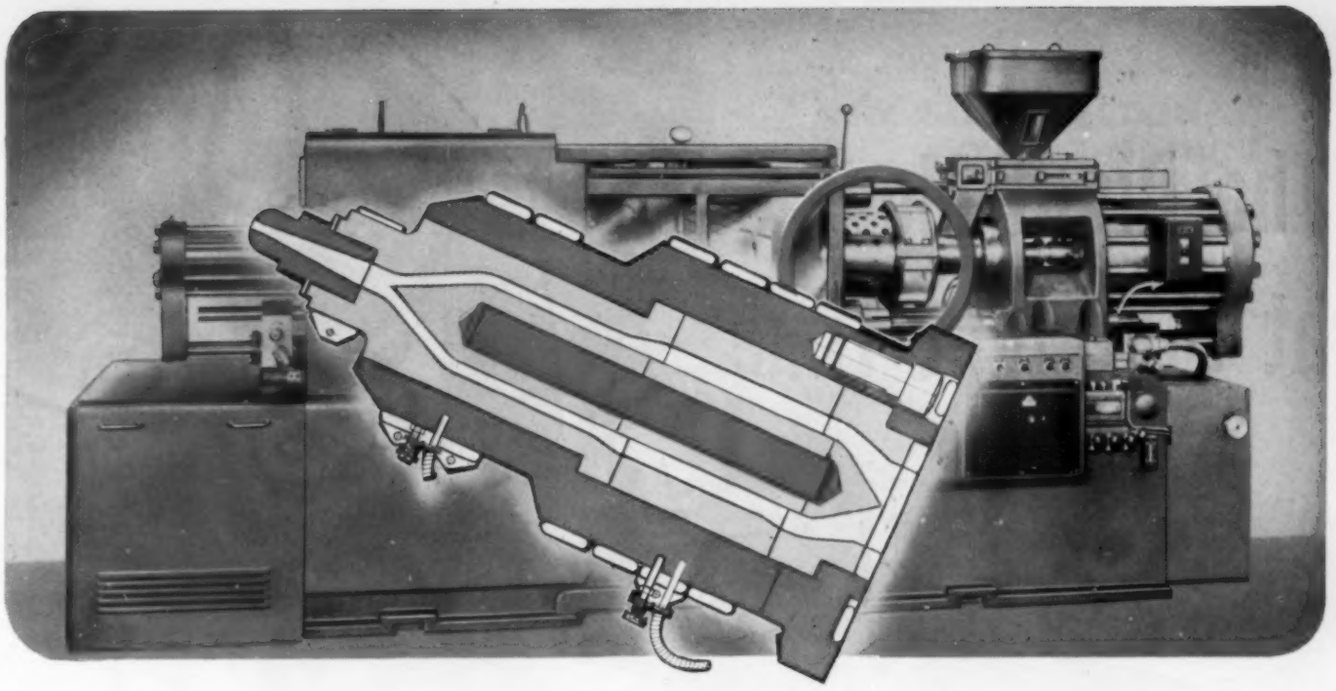
"More than Paper"

To the plastics industry, MOSINEE stands for paper-base processing materials with scientifically controlled chemical and physical properties, quality and uniformity . . . high tensile and tear strength with high absorptive capacity.

Other technical characteristics are controlled to meet specific plastics production requirements.

MOSINEE PAPER MILLS COMPANY • MOSINEE, WIS.

"Essential Paper Manufacturers"



Another NEW FEATURE . . .

NEWLY DESIGNED HEATING CYLINDER FOR REED-PRENTICE 10D-8 AND 10 OZ. PLASTIC INJECTION MOLDING MACHINES!

This new heater plasticizes material up to 20% faster although the operating temperatures are actually reduced as much as 15%. The increased efficiency is due to a copper core in the spreader. The heat conductivity of copper (9 times that of steel) results in high heat distribution to the furthermost points of the spreader. This simple construction feature is permanent and eliminates the maintenance required by any internal heating method.

Wattage of the heating bands has been increased to accommodate the high temperature requirements of recently developed plastic materials.

The heating cylinder itself is made from a special alloy steel with all internal surfaces chrome plated for resistance to corrosion and for ease of maintenance.

The 10D-8 and 10 Oz. machine now provides you with faster and more thorough plasticizing of the material, with resultant uniformity of molded parts — minimum rejects and waste.

The same improvements are incorporated in the heaters used in our entire line of injection machines. In addition to being standard equipment on new machines, the new heater construction can be supplied for use on 10D-8 Oz. machines already in operation. Address inquiries for descriptive literature about the complete line of 4, 8, 10, 12, 16 and 24 Oz. capacity machines to Dept. D.

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

CLEVELAND
1213 W. 3rd Street

INJECTION
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

NEW YORK
75 West Street

LOS ANGELES
2328 S. Santa Fe Ave.

The Right Move at the Right Time

and PLASTICS MAKE PERFECT!

WHEN YOU make a play for all the benefits that Plastics offer—let us help you plan and execute your attack. An experienced moulder's knowledge means just as much in planning as it does in actual production. It will smooth out design and production kinks—possibly cut costs—and certainly ensure a better, sweeter-running job.

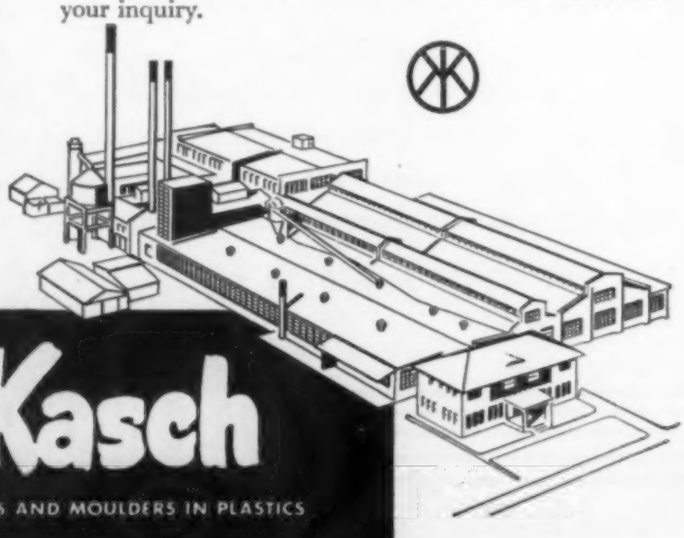
We'll take full responsibility for reproduction of your blueprints — quote a fair price on a job that will keep specified shipments of quality parts moving into your delivery docks at required dates. And with that quotation, we'll stake the 31-year-old Kurz-Kasch reputation for capability in plastics.

The Kurz-Kasch plant is large, modern and self-integrated for the design and production of any plastic part by compression, transfer or plunger moulding techniques. We're interested in your business — we'll send you a sales engineer at the drop of a hat — and we cordially invite your inquiry.

Kurz-Kasch, Inc., 1415 S. Broadway, Dayton 1, Ohio

BRANCH SALES OFFICES: New York, *Lexington 2-6677* Chicago, *Harrison 5473* • Detroit, *Randolph 5214* Franklin, Pa., *Venango County 186* • Los Angeles, *Prospect 7503* • Dallas, *Lakeside 1022* • St. Louis, *Rosedale 3542* • Toronto, Canada, *Adelaide 1377.*

EXPORT OFFICES: 89 Broad Street, New York City, *Bowling Green 9-7751.*



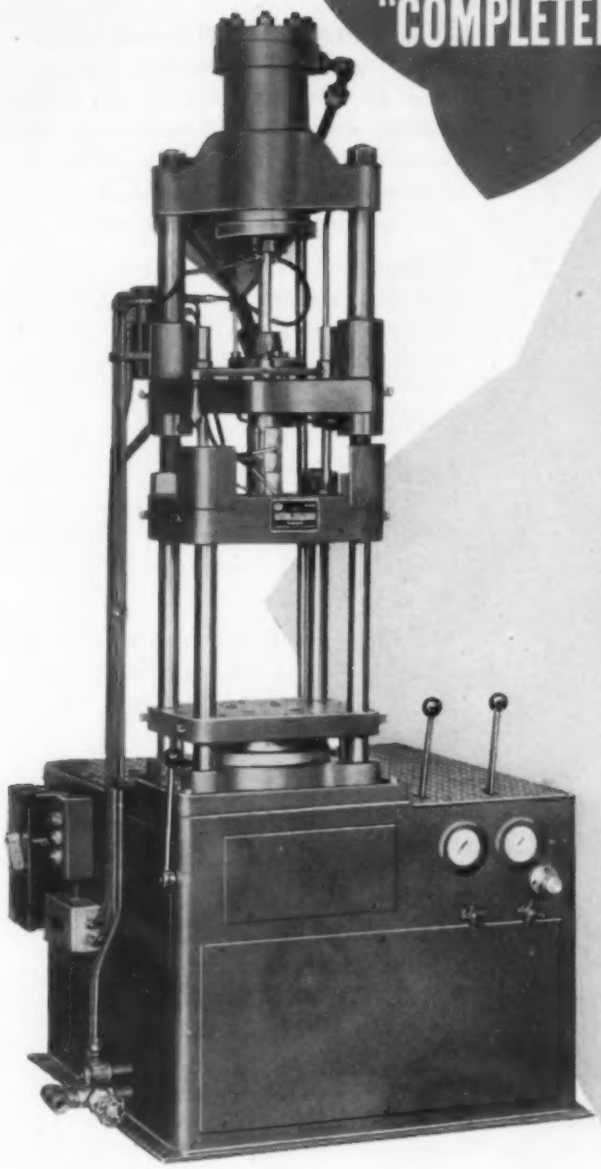
Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

Added to W-S "COMPLETELINE"

NEW 2-OZ. INJECTION MOLDING MACHINE

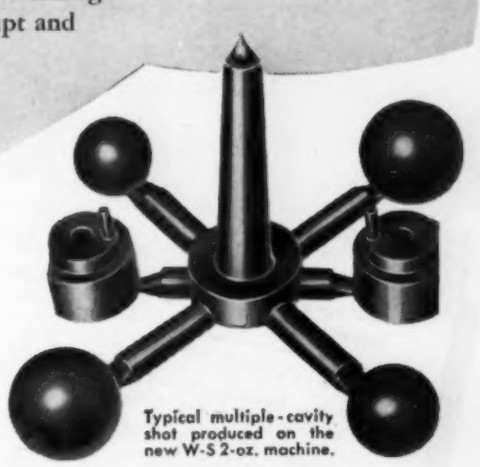
specifically designed for short-run production and pilot-plant work



Is your production schedule interrupted, heavy equipment tied up by small, short-run jobs? Here's a new low-priced machine, specifically designed to meet this problem. The new W-S 2-oz. Injection Molding machine provides:

1. Fast-acting cycle, manually controlled, which exactly matches operation and product of large units. Result: A precision product and the elimination of "unpredictables" from pilot-plant development work.
2. Simplicity and ease of operation. Result: Quick set-up, low maintenance.
3. Inexpensive heating cylinder permits use of two or more for rapid changeover.
4. Positive location of inserts on horizontal platen.
5. Water-cooled plunger.
6. Light, compact unit which fits conveniently into the smallest shop.
7. Safety in the two-hand, mechanically interlocked controls.
8. Adaptability to compression molding.

"COMPLETELINE" engineering counsel is available on virtually every commercial plastic and method of molding. Write or call the W-S representative nearest you. Put your current molding problem up to our staff of plastics-working specialists for prompt and resourceful action.



Typical multiple-cavity shot produced on the new W-S 2-oz. machine.

W-S "COMPLETELINE"

Vertical Injection Machines.....1, 2 & 4 oz.
Horizontal Injection Machines.....8 to 80 oz.
Compression Molding Machines....50 to 1200 ton
Transfer Molding Machines.....30 to 1200 ton
Laboratory Presses.....10 to 200 ton
Hobbing & Die Sinking Presses....200 to 3000 ton

Preformers • Plasticizers • Laminating and Polishing Presses • Record Presses

WATSON-STILLMAN

FACTORY AND MAIN OFFICE: ROSELLE, NEW JERSEY
BRANCH OFFICES: PHILADELPHIA, PA. • CHICAGO, ILL.

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BIRMINGHAM 3, ALA. . . . . George M. Meriwether
BUFFALO, N. Y. . . . . Tri-Line Corp.
CLEVELAND, O. . . . . Frank T. Goetz Machinery Co.
DALLAS, TEX. . . . . Perry Machinery Co.
DENVER, COLO. . . . . Overgard Machine Tool Co.
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Foreign Sales Representatives: OMNI PRODUCTS CORP., 460 Fourth Ave., N.Y.16, N.Y.
Correspondents Throughout the World

MANUFACTURERS OF THE MOST COMPLETE LINE OF HYDRAULIC MACHINERY

1118

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DIISOBUTYL KETONE

Ketones

ETHYL BUTYL KETONE

Available in commercial quantities —to give you formulating freedom in the manufacture of lacquers and synthetic resin coatings.

FORMULA	Diisobutyl Ketone $C_4H_9COC_4H_9$	Ethyl Butyl Ketone $C_4H_9COC_2H_5$
Boiling Point at 760 mm. Hg	168.1°C.	147.8°C.
Toluene Dilution Ratio at 20°C.	1.5	2.6
½ sec. R.S. Nitrocellulose Viscosity, 18% "Vinylite" resin VYHH Solution	Gel Structure	112 cps
Evaporation Time (Butyl Acetate = 8 hr.)	44 hr.	14 hr.
Weight per gal. at 20°C.	6.73 lb.	6.8 lb.
Specific Gravity at 20/20°C.	0.8089	0.8197

DIISOBUTYL KETONE

Dispersant—Best all around resin dispersant available for making organosols based on VINYLITE resin VYNV. Makes possible semi-hard and hard metal coatings containing little or no plasticizer, and aids in the preparation of highly plasticized coatings for cloth and paper.

Solvent—Retards premature evaporation in brushing lacquers, and reduces blushing in air-dried lacquers. Gives better flow-out and gloss to baked finishes.

ETHYL BUTYL KETONE

Dispersant—Produces fluid organosols having good viscosity stability on aging. Permits high solids content and makes good, clear films without checking ("mud cracking").

Solvent—Good solvent in both air-dried and baked finishes based on nitrocellulose or vinyl resins. Less active in lifting undercoats.

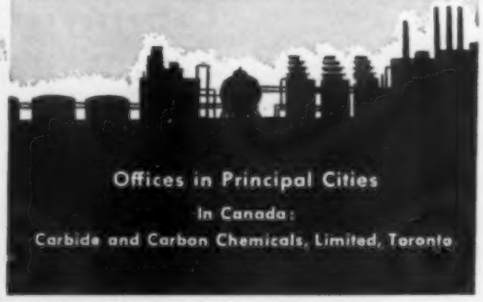
Intermediates—When condensed with amines and other chemical groups capable of reacting with the carbonyl group, these ketones give compounds of interest as inhibitors, rubber accelerators, dyes, pharmaceuticals, and insecticides. Ask for technical literature on diisobutyl ketone F-6934, and ethyl butyl ketone F-6918 —when writing please address Dept. L-3.

The word "Vinylite" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

CARBIDE and CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.



Offices in Principal Cities

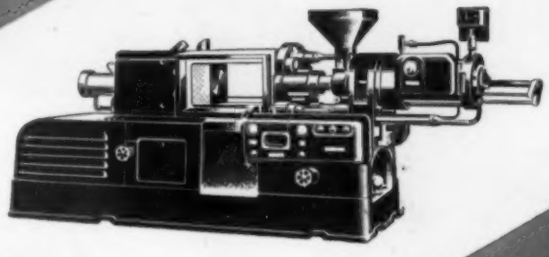
In Canada:

Carbide and Carbon Chemicals, Limited, Toronto

SPECIFICATIONS

WHICH PROCESS

should we use for your moldings?



"It makes little difference," you say, "so long as each finished piece fulfills your requirements in strength, dimensions, appearance and so on."

But it's to your advantage that we don't feel that way at Norton.

Our design engineers and technicians, working with your men or direct from your blueprints, are mindful of molding "habits" that may make a material best suited for the application in hand . . . possibilities for improvement through minor design changes . . . and the potentials of each molding technique.

So in terms of your satisfaction, it makes a *lot* of difference to Norton which process is used. And with more than 20 years of experience in fine custom plastics molding . . . injection and compression . . . we have learned the advantages and the limitations of each process.

Whether you are now contemplating your first adventure in plastics, or are an old hand at the business, Norton has a method of approach and a plant set up you can use.

These factors mean efficiency and economy in the long run . . . on the short one too. Why not write us? Norton Laboratories, Inc., Lockport, N. Y.

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

IMMEDIATE PRODUCTION—Our facilities now permit production on new orders without delay.

DETROIT PUBLIC LIBRARY

DURITE

✓ BEAUTY OF DESIGN
✓ HIGH LUSTROUS FINISH
✓ GOOD DIELECTRIC STRENGTH
✓ STURDY AND DURABLE
✓ PRODUCTION ECONOMY

DURITE Phenolic Compounds include these ideal properties essential to the production of handles for electrical pasteurizers.

DURITE PLASTICS
DIVISION OF THE BORDEN COMPANY
5000 SUMMERDALE AVE., PHILADELPHIA 24, PA.

★

IT'S NEW!

NRM

BALANCED HEAT CONTROL

QUICKER COOLING

3 SEPARATE CONTROLLED HEATING ZONES

NEW CONTROL GROUPING

COMPACT DESIGN

HYDRAULIC DRIVE

1½" NRM Electrically Heated Thermoplastics Extruder

FIRST, its extreme compactness and streamlining take the eye. Then, as closer inspection reveals feature after feature, it quickly becomes apparent that this is a *new* extruder of *new* design.

Among the many outstanding features that make this new NRM extruder so far advanced is the unique method to obtain balanced heat conditions and closer individual temperature control in each heating zone. Temperatures up to 800°F. are closely held with conveniently located pyrometer type controllers . . . voltage regulators are used to provide just as accurate control at the lowest extruding temperatures.

Now it is possible to obtain close tolerances with a direct electrically heated unit designed for the extrusion of practically all thermoplastics.

Hydraulic drive with infinite screw speed adjustment . . . two-zoned quick cooling . . . full flighted or patented NRM torpedo-type screw . . . are some of the other features which make it *all important* that you get complete specifications on this new NRM extruder without delay.

Write today for complete information on NRM's newest development for the finer, more economical and profitable extrusion of thermoplastics.

NATIONAL RUBBER MACHINERY CO.
General Offices: AKRON 8, OHIO
California Representative: Sam Kipp, P. O. Box 441, Pasadena 18, Calif.

Plastics
MACHINERY DIVISION

EXPORT DISTRIBUTORS: OMNI PRODUCTS CORPORATION, 460 FOURTH AVE., NEW YORK 16, N. Y.

COMMON SENSE ASSEMBLY ENGINEERING

"Rings up" a 75% Saving

- adds fastening strength

Two P-K Binding Head Type "F" Self-tapping Screws are used to fasten the fiber lamp access plate to the smartly designed, sturdy DUREZ *case, molded by* TECH-ART PLASTICS CO.

LITE-A-PHONE CORP. experienced costly difficulties in the assembly of their plastic desk sets, until a P-K advertisement suggested the solution to their problem.

Screws previously used to fasten the fiber lamp access plate to the plastic case frequently came loose. The plates were lost or damaged, thus creating a troublesome replacement and servicing expense. By changing to P-K Type "F" Self-tapping Screws, Lite-a-Phone Corp. eliminated the need for inserts in the plastic, and saved the cost o parts replacement, servicing, and additional handling.

Why not "ring up" similar savings by applying common sense engineering to your assembly problems. You can avoid needless, mold-slowing inserts or troublesome tapping for machine screws, and often open the way for desirable improvements in product design, reducing weight without sacrificing strength.

Call a P-K Assembly Engineer. In 7 out of 10 cases, he can demonstrate that P-K Self-tapping Screws will save up to 50% in assembly work-hours. If you prefer, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

P-K® Reg. U.S. Pat. Off.

PARKER-KALON SELF-TAPPING SCREWS

OTHER PARKER-KALON PRODUCTS COLD-FORGED SOCKET SCREWS • HARDENED SCREWNAILS AND MASONRY NAILS • SHUR-GRIP FILE AND SOLDER IRON HANDLES • METAL PUNCHES • DAMPER REGULATORS AND ACCESSORIES

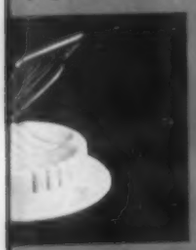
All America is reading ads like this!

Let's go selling with STYRON

DOW'S FAMOUS PLASTIC

Here's another reason why molders are turning to Styron (Dow Polystyrene) for products that *sell!* Aggressive advertising and promotion are constantly strengthening Styron's position as America's No. 1 plastic. This month all America is reading four-color advertisements in the best national magazines . . . all America is shopping for Styron in leading stores which are tying in with this big housewares promotion. And this is *only the first* of several big Styron campaigns! For better products—for greater sales—tie your product to this popular name. Let's go selling *better* plastic products . . . "made of Styron"!

Illustrated at right: Colorful bowls with Tupper Seal by Tupper Corporation. Re-Fresher Box by The W. & A. Company for Ruzak Industries, Inc. Kitchen Knife Set with Styron handles by Lanfare Molded Products for The Clyde Casting Co. Novel Egg-Cessory egg cups by American Injection Molders, Inc.



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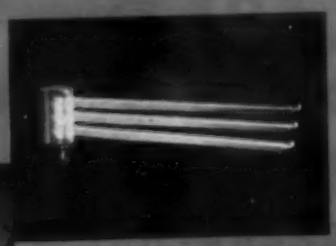

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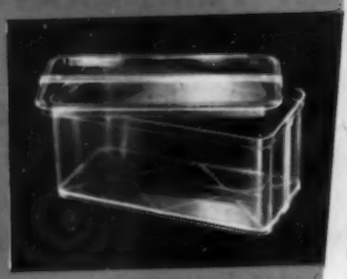

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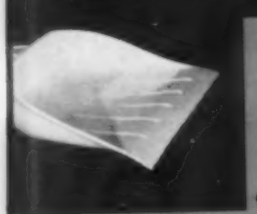

6

1. **EGG SLICER** uses Styron to give an old product new popularity. By Connecticut Plastic Products for Medco Products Co., Inc.
2. **SALAD FORK AND SPOON** have added sales appeal in Styron colors. By Mack Molding Company.
3. **TOWEL RACK** in colorful, moisture-proof Styron. By Columbus Plastic Products, Inc.
4. **RE-FRESHER BOX** is a best seller because of Styron's low-cost practicality. By Tri-State Plastic Molding Co. for Ruzak Industries, Inc.
5. **"HANDE BOWLS"** (custard cups) in gay Styron colors catch every woman's eye. By The Burroughs Co.
6. **DUST PAN** benefits from Styron's light weight and rigid durability. By Pyro Plastics Corp.

Let's go shopping with
STYRON
DOW'S FAMOUS PLASTIC
Follow the trail of color through the
and you'll find a wealth of new prod
achieving unprecedented beauty—
old products made finer—with Sty
(Dow Polystyrene). Their brilli
colorful surfaces attract the ey
and despite its light weight, Sty
is amazingly durable. That's w
Styron is chosen for an abunda
of colorful new aids to fi
living. And that's why Dow
instituted this "Shopping Servic
—to help you recognize Styr
in important new produc
A DOUBLE LIFE is destined for these colorful bowls—right on the table—or in the refrigerator. They're transparent Styron with Tupper-Seal flexible covers. By Tupper Corporation.
KEEP IT UNDER COVER—yet plainly visible—in this transparent Re-Fresher Box made of Styron. Suitable for cookies or doughnuts, it maintains their freshness—for Styron holds goodness in, yet imparts no taste or odor to edibles. By W. & A. Co., affiliated with Ruzak Industries.
CUTTING, SLICING, PARING are no longer chores in food preparation when the right knife is conveniently at hand. This set of seven with colorful, light weight handles of Styron, won't chip or peel, and are shaped for ease in grasping. By Lanfare Molded Products for the Clyde Casting Company.
EGG-CESSORY of colorful Styron is a new type egg cup so practical you'll wonder why it hasn't been thought of before! It can't tip over, thanks to its special saucer base that serves also to catch drippings and hold the shells. By American Injection Molders, Inc.
Dept. HW-1—PLASTICS DIVISION
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN
Guaranteed by Good Housekeeping
MADE OF STYRON
DOW

MADE OF STYRON

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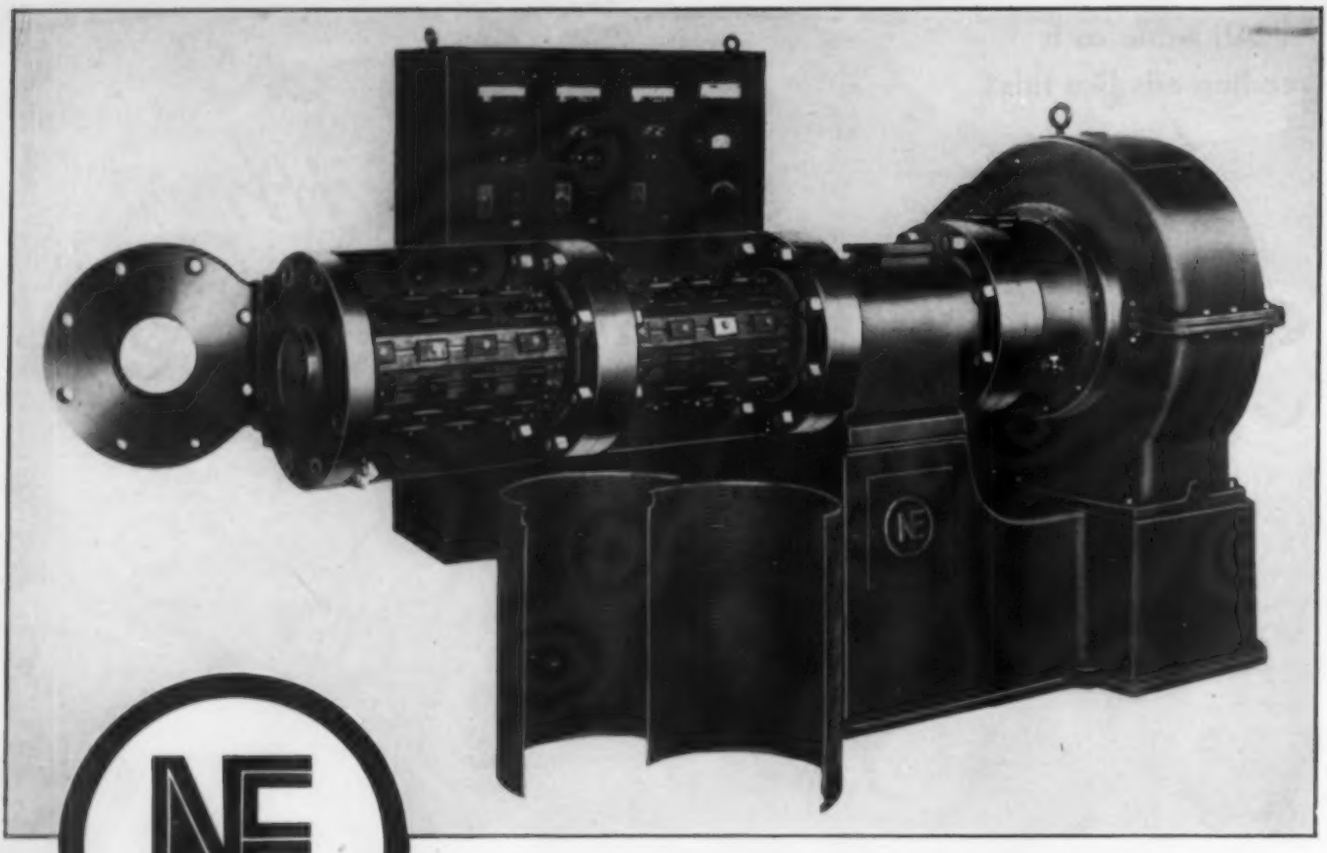
Take Advantage of Promotions like this . . . Tie in with

PLASTICS DIVISION, DEPT. HW-22 • THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN



presents **NEW LINE OF ELECTRICALLY HEATED EXTRUDERS—THE ANSWER TO PROCESSING HIGH TEMPERATURE PLASTICS**

NE Products

- EXTRUDERS
- STRAINERS
- HYDRAULIC PRESSES
- MIXING MILLS
- LABORATORY PRESSES
- SIMPLEX DOORS for Pressure Vessels
- STEEL CASTINGS and GEARS to Any Specifications.

THE above NE extruder features direct contact, electrically heated cylinders for the extrusion of high temperature plastics—up to 750° F. This electrical method provides clean and safe operation over a wider temperature range than is possible with any other heating medium. More accurate control and more uniform heat application throughout the cylinder is possible with this method. It is adaptable to any extruder. Consult with NE engineers for recommendations on electric heating for your extruders.

• *Write for copy of our general catalog that fully describes NE Extruder's 5-unit construction.*

NATIONAL ERIE CORPORATION

ERIE, PENNSYLVANIA • U. S. A.

Bathing Beauty

THAT TAKES PRIZES FOR YOU!

● Here's new beauty in shower curtains that will win profits for manufacturers of a wide range of different products.

The curtains are made of *Resproid*, a beautiful new material you will find just as pretty, practical and profitable in different weights for waterproof garments, handbags, luggage, aprons, cottage sets, furniture upholstery — a variety of uses as wide as your own imagination.

Resproid comes in a lovely rainbow of jewel-like colors and pastel shades — colors practical anywhere because surface dirt wipes off in seconds with just a damp cloth — colors that stay beautiful because *Resproid* is specially formulated to resist fading, cracking, scuffing and abrasion, most acids, alkalies, oil and alcohol.

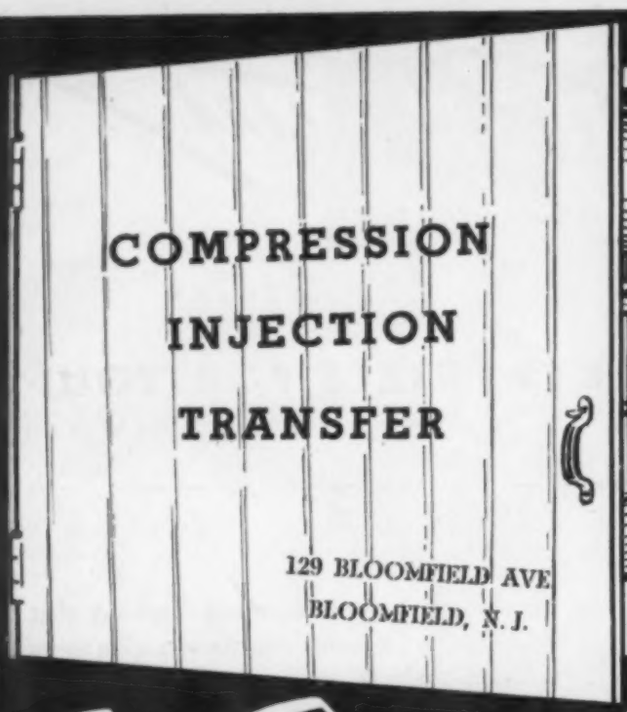
With a big, 4-color advertising campaign in Good Housekeeping magazine telling over 5,500,000 potential customers about *Resproid* this year, there's a gilt-edge profit opportunity waiting you can cash in on. No matter what other materials you are familiar with, it will pay you to write for samples of *Resproid*. Today! Respro Inc., Cranston 10, Rhode Island.

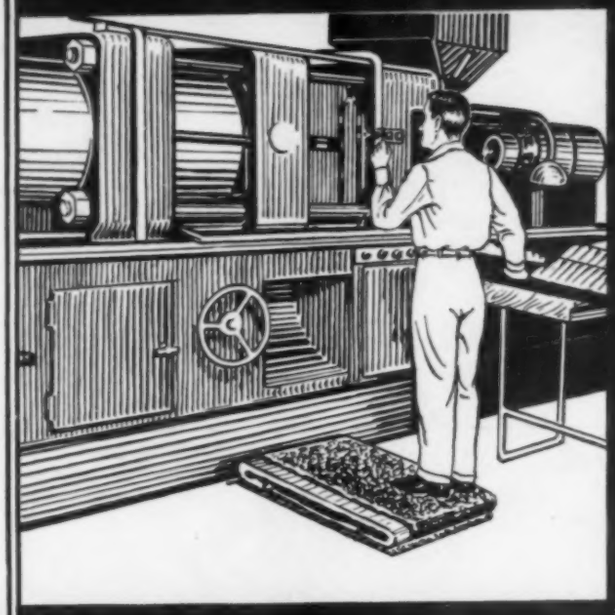
Guaranteed by Good Housekeeping

Resproid

Resproid

TRADE-MARK REG. U. S. PATENT OFFICE





The Door that Opens to...

ECONOMICAL, ACCURATE, EFFICIENT PRODUCTION

Bring your plastic problems through this door for an effective service that combines ability and experience in engineering and moulding—

Our staff will quickly translate your ideas into finished products.

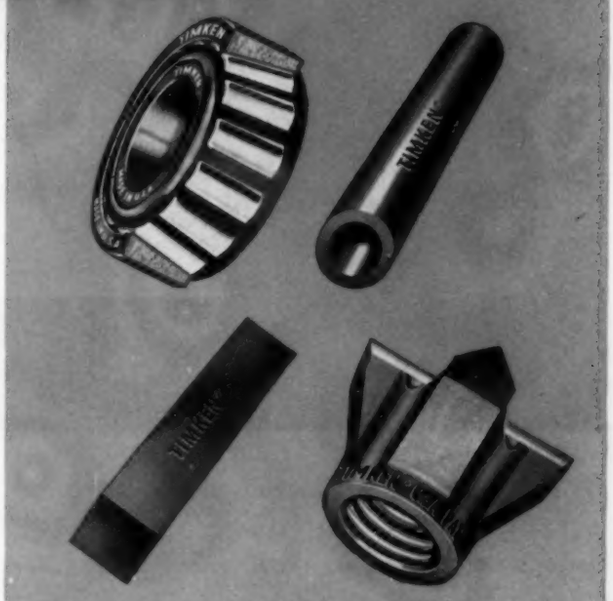
Bloomfield
MOLDING COMPANY
BLOOMFIELD NEW JERSEY

NOT A BRAND,

BUT A BRAND PROTECTOR

"CIRCLED R"

TIMKEN®

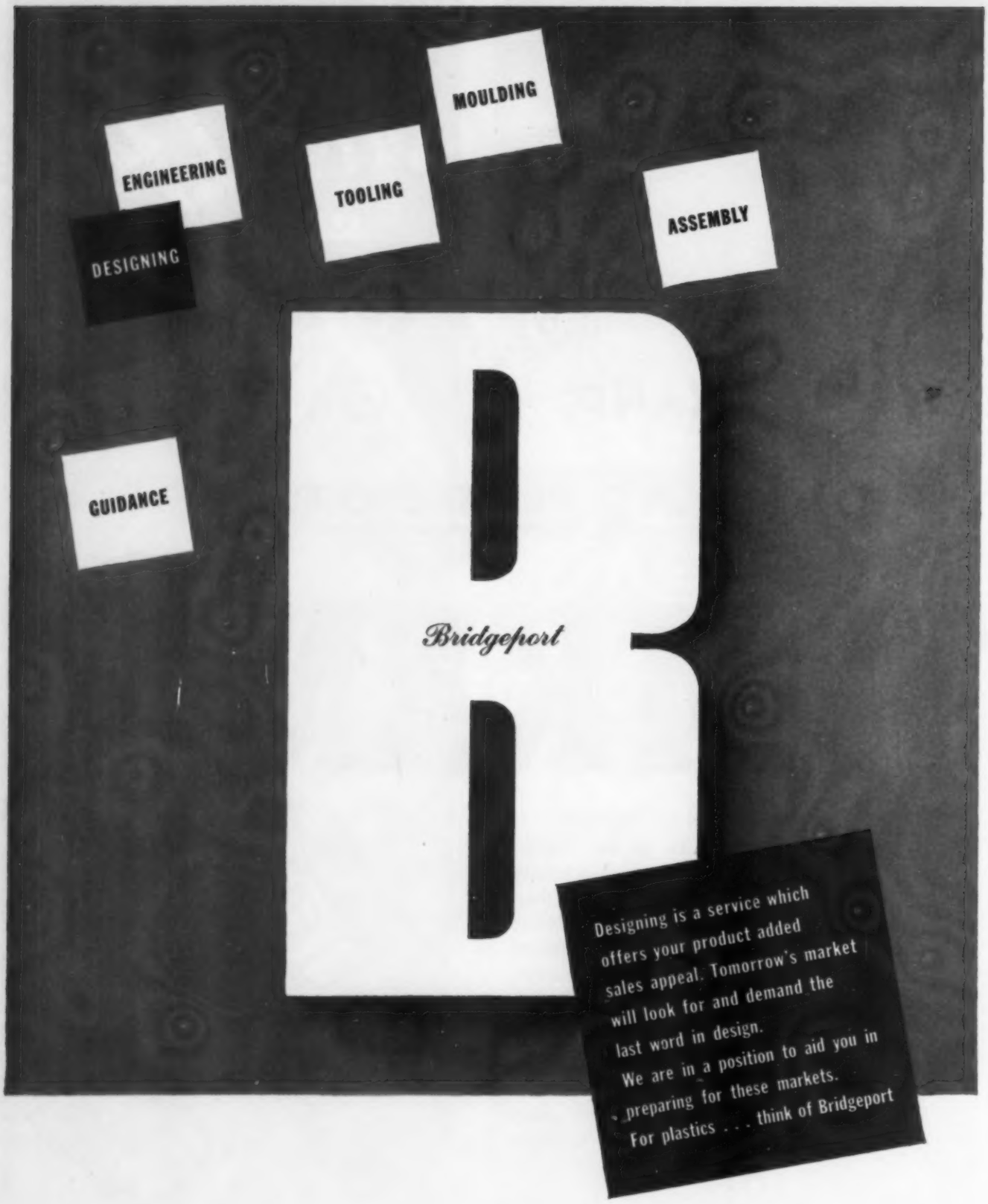


It tells the world that "TIMKEN" is registered as a trade-mark in the United States Patent Office and cannot lawfully be used to designate products other than those manufactured by The Timken Roller Bearing Company — Timken Tapered Roller Bearings, Timken Alloy Steels, Timken Seamless Steel Tubing and Timken Rock Bits:

The trade-mark "TIMKEN" is the buyer's assurance of the finest products in their respective fields. Look for it. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ⊣◫⊢ LOADS OR ANY COMBINATION ✳


ENGINEERING
MOULDING
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Designing is a service which offers your product added sales appeal. Tomorrow's market will look for and demand the last word in design.
We are in a position to aid you in preparing for these markets.
For plastics . . . think of Bridgeport

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

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1868-1948
CELLULOSE NITRATE
THE
VERSATILE
PLASTIC

Away back in 1868, cellulose nitrate was developed by treating cotton cellulose with nitric acid. This was probably the origin of the present plastics industry.

TOUGH
BUT ALSO ECONOMICAL

NIXON C/N (Cellulose Nitrate) is a moderately priced plastic possessing many outstanding qualities. It is quickly formed and shaped . . . it can be easily machined . . . it lends itself ideally to cementing. It is dimensionally stable. It resists ink and moisture. It comes in an unlimited range of colors. It can be easily printed or engraved with decorative designs and lettering. NIXON C/N, NIXON C/A (Cellulose Acetate), and NIXON E/C (Ethyl Cellulose) are all available in Sheets, Rods, and Extruded Shapes. Molding Powders are available in Cellulose Acetate and Ethyl Cellulose.

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CELLULOSE
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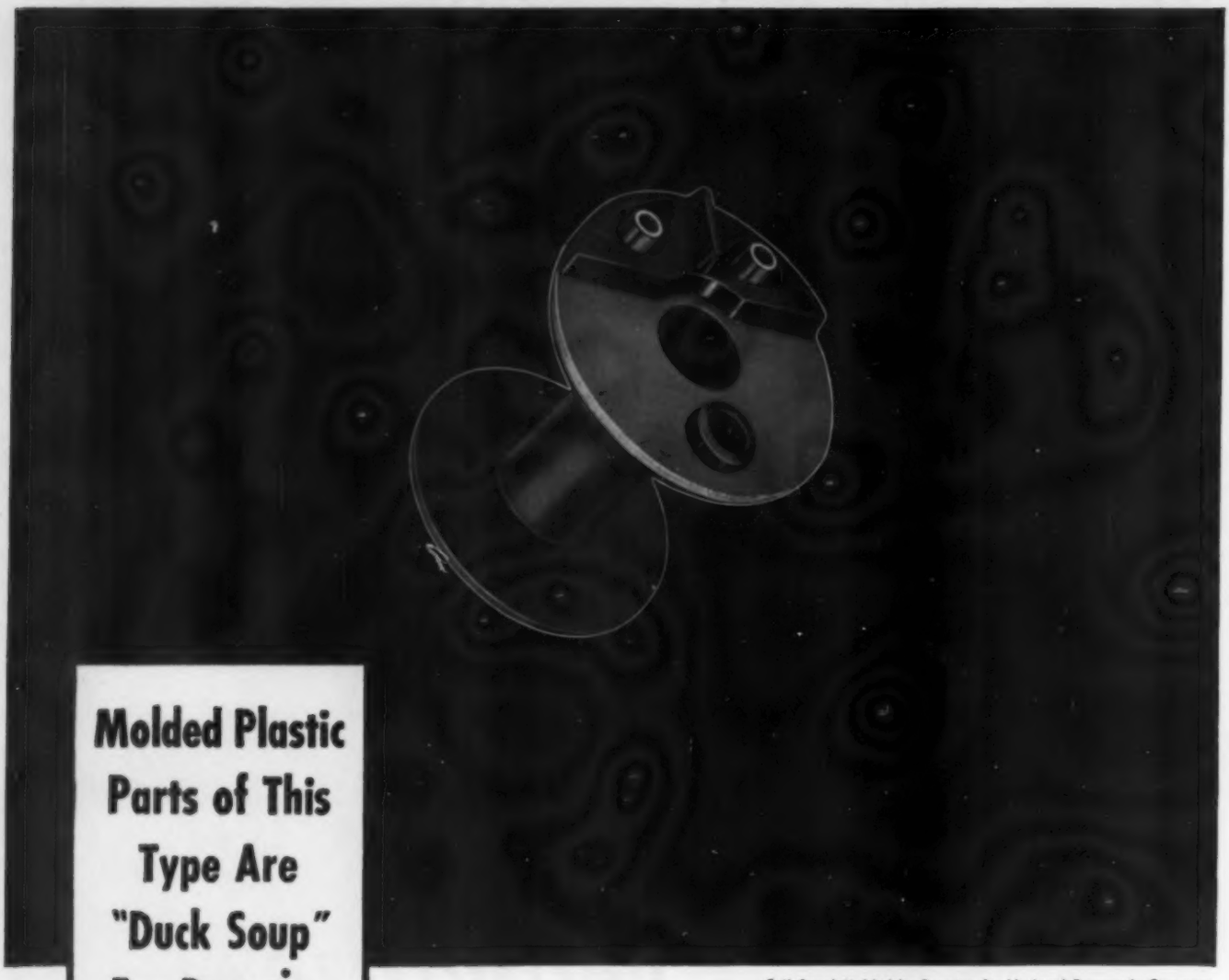


Molded Plastic Parts of This Type Are "Duck Soup" For Boonton

Coil Spool Molded by Boonton for National Pneumatic Company

Have you a Production Problem that Molded Plastics might solve?

WHAT'S in a coil form like this? Careful engineering and design. Sure! But there's a Boonton plus here too—a molded plastic base with metal inserts anchored where they're needed. A lot of plastic molding "know how" to mold it all—accurately to thousandths—ready for your assembly line.

Does this give *you* an idea for a product, part, or housing you're designing—that can be plastic molded cheaper, quicker. Boonton's equipped to mold by all 4 major molding processes—in medium and large runs.

Many of our customers have saved substantial sums of money by asking our engineers to talk to their engineers before their products reached the purchasing stage. They've been amazed and pleased at the ways we've come up with design and production suggestions that shaved costs all the way around. Perhaps we can do the same for you. Maybe we've learned something in our 25 years of molding plastics that can be helpful to you. We'll be glad to share this experience with you. Write or phone The Boonton Molding Company, Boonton 3, N. J., Boonton 8-2020.

Boonton

FREE to Prospective Buyers of Molded Plastics "A Ready Reference for Plastics". Get this 80-page book. Factual data on design, comparative plastic properties, molding methods.

MOLDERS OF MOST PLASTICS BY MOST METHODS

SOLVE SURFACE SHEET PROBLEMS with VARCUM 2695

(A PHENOL FORMALDEHYDE VARNISH)

Colored or pattern-printed papers impregnated with VARCUM 2695 make surface sheets which are much more flexible than those impregnated with melamine. This added flexibility reduces wasteful breakage caused by handling. Moreover, when both core and surface stock are impregnated with substances having similar chemical and physical characteristics, better molding takes place. The resulting surface is less brittle, less apt to crack or fray.

Phenolic core laminates surfaced with a VARCUM 2695 impregnated decorative sheet have very good dimensional stability and a surface which will not chip during sawing or sanding operations. Laminates surfaced with VARCUM 2695 are warm to the touch and have good abrasion, scuff, strain and solvent resistance as well as good color retention even under prolonged exposure to sunlight.

VARCUM 2695 can be used for both high and low pressure laminates. Its specifications are: Solids — 72±2%; Viscosity — 1000 to 1750 centipoises; Curing time — 40 to 50 seconds (at 150°C.).

Properties of VARCUM 2695 recommend it for use in surface sheets on interior panels for station wagons, passenger car instrument panels, plywood surfacing and table tops in pastel colors or wood grains.

WRITE FOR SAMPLES

We will be glad to send you a working sample of VARCUM 2695. We also have core stock varnishes or liquid resins to meet your requirements. Just write us on your company letterhead.

Synthetic VARCUM Resins

VARCUM CHEMICAL Corporation

NIAGARA FALLS, N. Y.

Out in Front ...in Controlling FLASH, too!

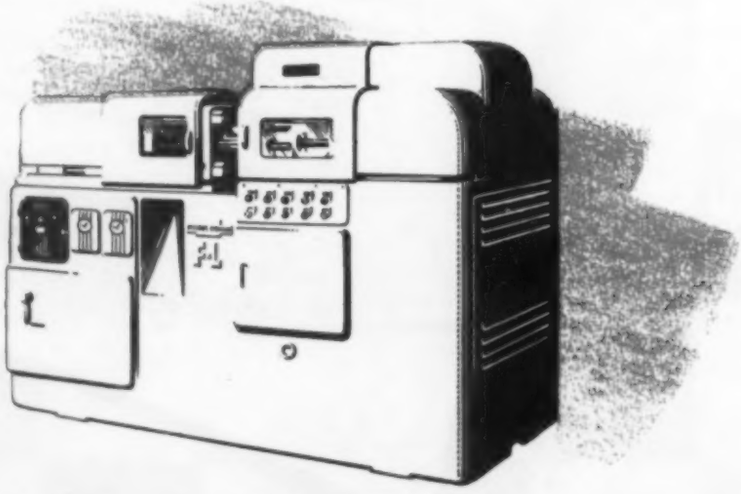
With molds suitably designed and made, and a Fellows-Leominster Injection Molding Machine, the tendency to mold separation and resultant flash is greatly minimized.

The Continuous-Pressure-Line Toggle design that makes this molding advantage possible is a feature found only on Fellows-Leominster machines. The diagrammatic illustration at the right explains the advantages of this Toggle action... and why no other toggle design offers such operating advantages.

For this, and many other reasons of design superiority, your next molding machines should bear the Fellows-Leominster name. For complete details write our nearest office.

Only in F-L Speed-Flo Molding Machines do you get all these advantages

- ★ Fast plasticizing SPEED-FLO Taper-Bore Cylinder
- ★ TAPER-TITE Separator for improved heat distribution
- ★ Single RATCHET-EASE Take-up Screw for mold closing adjustment
- ★ HYDRAULIC-MOBILE Nozzle Slide for easy purging
- ★ VARIABLE Injection Pressure and Speed
- ★ SAFETY-INTERLOCKED Push Button Controls



THE FELLOWS GEAR SHAPER COMPANY • Plastics Machine Division
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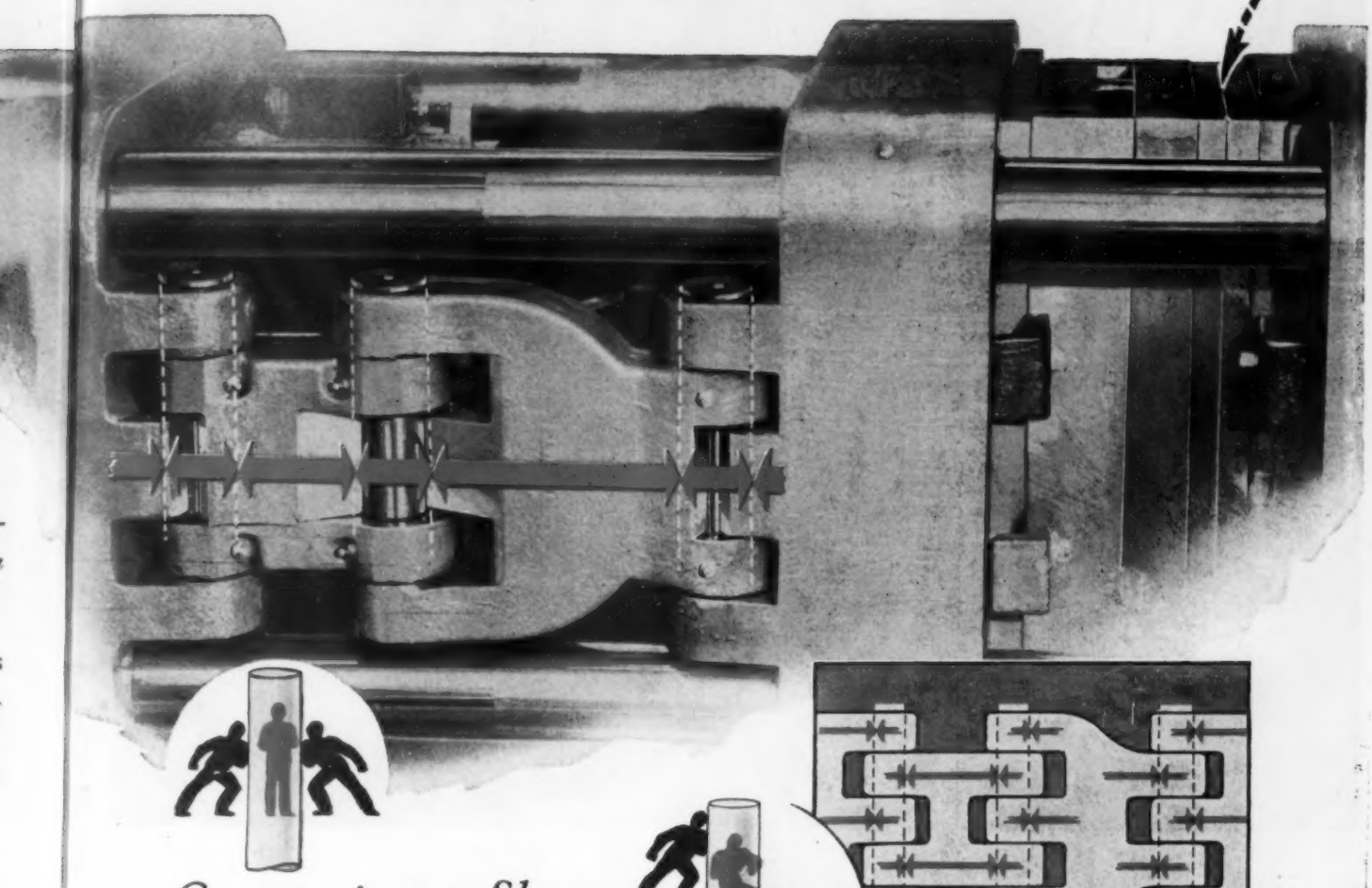
640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1
New England Distributor: Leominster Tool Company, Leominster, Mass.

sivContinuous-Pressure-Line Toggle Design Reduces Mold Separation



Compression vs. Shear

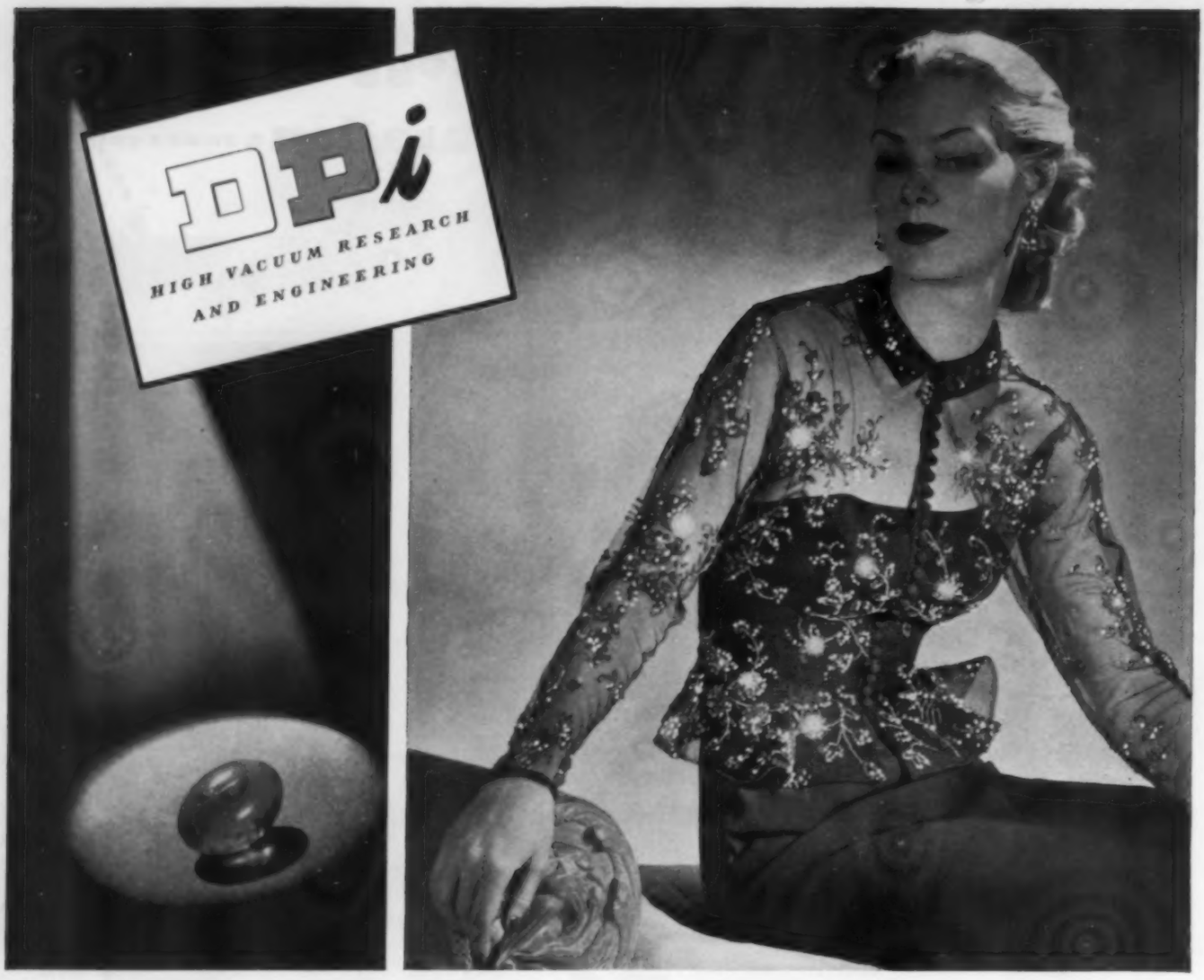
The strength-rigidity of Fellows toggle design is evident. Tons of pressure on sturdy toggle pins is taken in compression between direct-in-line bearing surfaces of the toggle links. Reduced shearing strain on the pins eliminates breakage. There is also greater resistance to injection pressure that might force the molds apart, thus greatly minimizing flash.

Conventional Toggle Design from which the Improved-Continuous-Pressure-Line Toggle was evolved.

Fellows

LEOMINSTER

injection molding equipment



Dress by Ceil Chapman

Vitamins and Sequins from a Vacuum

Both were born in a vacuum—the vitamin concentrate in a high-vacuum still that enables molecules from a hot liquid to separate unimpaired in potency.

The sequins were made in a high-vacuum chamber. Here molecules of heated metal, unhampered by atmospheric pressure, travel as metallic vapor to coat the sequins with a beautiful, brilliant surface. Nearly any metal can be used—gold, silver, aluminum, copper—and the material to be coated can be most any substance—metal, rubber, paper, cloth, glass, plastic.

Perhaps nothing can better illustrate the wide potentialities of high vacuum technology than a vitamin capsule and a tiny sequin scintillating on milady's evening gown.

These are but two of many practical commercial possibilities. For research has barely opened the door—it still stands on the threshold.

Excellent opportunities exist for high-vacuum processes in petroleum engineering, in medical science, in metallurgy, in dehydration, in food concentrates, in textiles, electronics, plastics, in atomic energy!

DPI maintains a special experimental department. Its experience and knowledge of high vacuum can aid research staffs in the many branches of science and industry. As a first step, write for information on high-vacuum applications in your particular field.

Also available, a limited number of 5-liter capacity high-vacuum centrifugal stills which may be purchased for your own laboratory for distillation of materials of high molecular weight.

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DP I

Manufacturers of Molecular Stills and High Vacuum Equipment; Distillers of Oil-Soluble Vitamins and other Concentrates for Science and Industry

Adding Beauty to Utility in the modern car's ensemble – with

ERIE RESISTOR

custom molded plastics

In the keen competition for after-war customers, with performance so closely matching performance, alert automobile manufacturers are paying increased attention to the little spots of beauty that add so much to attractiveness while adding little or nothing to cost. Naturally, Erie Resistor, pioneer in injection custom molded plastics, is in the forefront in its cooperation with car builders; in the production of parts as designed by the manufacturer; in suggesting changes in design for improvement of the finished product or for its more efficient production; and in suggesting parts that can be made of plastics, with increased economy, or utility, or beauty, or all three.

Manufacturers in other fields, too, making everything from cosmetics to washing machines, are turning to Erie Resistor for help in package and parts design and molding; for the achievement of a sales appeal that begins with the dealer's store, and lasts for the life of the product.

Whether your thinking has arrived only at the stage of wondering whether plastics may be the answer, or of complete specifications of what you want, don't hesitate to write.

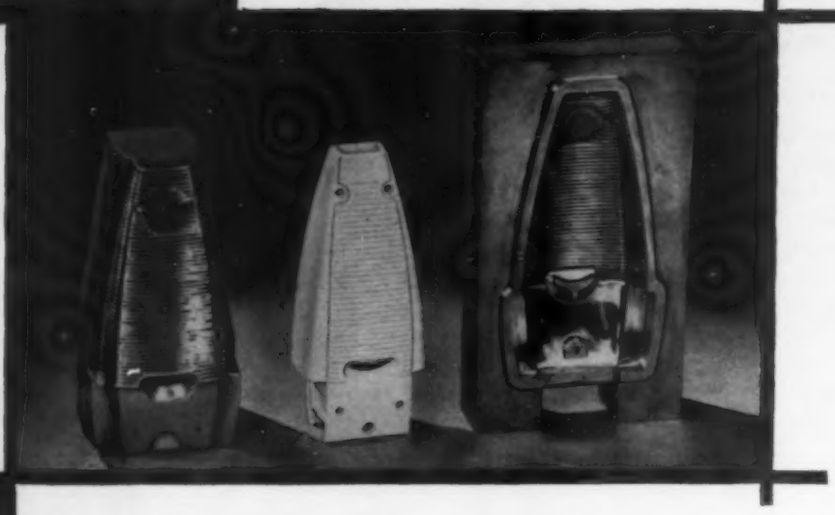
Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND · · TORONTO, CANADA

DISSTON MOLD STEELS

SPECIAL TYPES TO MEET ALL MOLD REQUIREMENTS



Whatever the molding method you employ, or the size and shape of your products, one of the three special Disston Mold Steels will exactly suit your needs. Each is composed of carefully selected raw materials, and is produced in electric furnaces by modern steel practice, with every process under rigid control. Each is uniformly sound, carburizes evenly and produces unusually smooth cavities.

DISSTON PLASTIRON is a low carbon iron that withstands extreme hobbing. Recommended for difficult shapes and short runs.

DISSTON PLASTALLOY is a low carbon steel containing sufficient nickel and chrome to assure great core strength and resistance to wear, yet permit easy hobbing. Recommended for medium runs.

DISSTON PLASTIKUT is a "cut mold" steel with alloy content for maximum core and case strength. Because of its hardness, Plastikut must be machined instead of hobbed. But its ability to stand up under long runs makes its use economical.

Write for folder which tells what to look for and what to avoid in selecting mold and hob steels. Also contains analyses of Disston Mold and Hob Steels and other helpful information.

Disston metallurgists and engineers will be glad to help you find the right answer to your mold and hob problems.

STEEL:

Everybody who wants to obtain steel can help to get it by immediately starting scrap into channels that serve steel mills.

HENRY DISSTON & SONS, INC., 334 Tacony, Philadelphia 35, Pa., U. S. A.

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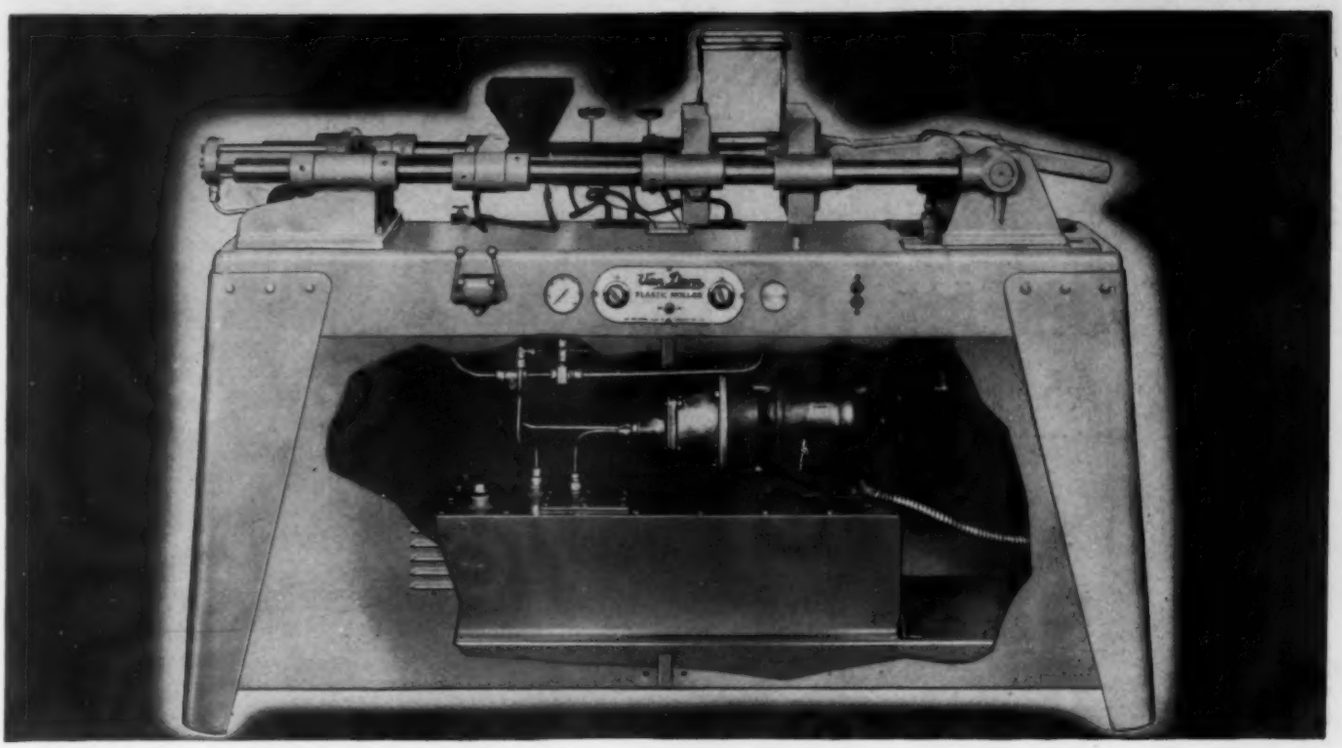
Bright Steel Corporation, Offices & Warehouses, 528-540 West 22nd Street, New York 11, N. Y. and 224-236 Culver Avenue, Jersey City 5, N. J.



FOR *Profitable* PLASTICS PRODUCTION

SEE WHAT THIS VAN DORN PRESS *offers:*

- **FAST SET-UP** by one man in 20 minutes or less.
- **EASILY OPERATED** by semi-skilled help; simple handy controls.
- **PRODUCTION-POWERED**-maintains up to 120 operating cycles per hour.
- **UNLIMITED USES**-ideal for hundreds of items weighing 1 oz. or less.
- **VERSATILE**-molds practically all thermoplastics including nylon.
- **INEXPENSIVE MOLDS** keeps your investment at a minimum.
- **AUTOMATIC** parts ejector.
- **THERMOSTATIC** heat controls.
- **SAFETY GUARD** must be in place before mold will close.

AND *THIS REMARKABLE PRESS COSTS UNDER $2000!*

All these features, many of them found only on presses costing far more, make this Van Dorn 1 oz. injection press *unexcelled* for:

Profitable production of small parts
"Pilot" or experimental runs on bigger jobs
Laboratory work and technical training

We make mold bases for Van Dorn Presses.

THE *Van Dorn* IRON WORKS CO.
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Get ALL the Facts—
Write for FREE Bulletin describing Model H-200 Van Dorn Press and its many applications.

NEW ORLEANS INVITES THE PLASTICS INDUSTRIES

A NEW ORLEANS LOCATION MAKES SENSE... and *PROFITS!*

TRADE FACILITIES...unequalled. New Orleans International House (above) and International Trade Mart (below) aid in your buying-and-selling with Latin America and the world. The new Foreign Trade Zone gives you competitive advantages in manufacturing, exporting, and importing.

HERE ARE MARKETS...New Orleans is strategically located to serve two great manufacturers' markets—the rich Mid-Continent area and the fast-growing 10-states Southern market, whose effective buying income has more than doubled in 5 years--and a vast, buy-minded export market comprising all South and Central American republics, Mexico and the Caribbean area.

HERE ARE RAW MATERIALS...in abundance. Cotton, cotton linters, soy beans, wood pulp, soda ash, bagasse, petroleum, and their thousands of derivatives—cellulose, lignin, the acids, carbon black, etc.—all are produced within city limits or just a few miles beyond. Imported through the great port of New Orleans are casein, castor beans and other materials indispensable to the manufacture of plastics—available here without additional transportation expense.

HERE IS TRANSPORTATION...with a combination of facilities unequalled elsewhere. Modern, sheltered harbor, 97 ship and barge lines, 9 trunk railroads, 8 major airlines, well-kept highways, a 13,000 mile network of inland waterways. LOW COST FUEL... unlimited; natural gas from fields near New Orleans; abundant, economical electricity from gas-fired steam power plants. SKILLED LABOR...plentiful, intelligent, cooperative. New Orleans' permanent labor supply has more than doubled since 1940. FRIENDLY TAXATION, local and state, encourages industrial growth. Investigate now.

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a copy of our recently completed study, "Manufacturing Opportunities in Plastics in New Orleans." Write:

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● In our world of tomorrow that soon will be today, beauty plays a new and leading role. For modern designers have found beauty has in it the essence of utility. Auto-Lite's great Bay Manufacturing Division reflects the importance of this new trend. Here under one roof are the technical skills and production capacity for a new art rendered in plastics including brilliantly colored elastomeric plastics, decorated metals and metal-plastic combinations. The artistic skill of Auto-Lite's Art and Style Division is available on matters of style and development.

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Auto-Lite

plastics and metals

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Tune in the Dick Haymes Show for Auto-Lite, Thursday, 9:00 P.M.—E.T. on CBS.

TITANOX . . . *the brightest name in titanium pigments*

TITANOX
pigments
make for a
bright white
or pleasing pastel
in plastics...

Compounders find that TITANOX pigments impart maximum whiteness to plastics. They also assure an attractive pastel tinted product – one that stays good-looking a long time.

There's another reason why the plastic industry is turning to this "brightest name in titanium pigments". TITANOX pigments control the degree of translucency or gives complete opacity, as desired.

The unusually great demand for these famous titanium pigments makes it difficult for us to fill your requirements completely. So we must ask your patience if we are unable to supply all you need.

TITANOX
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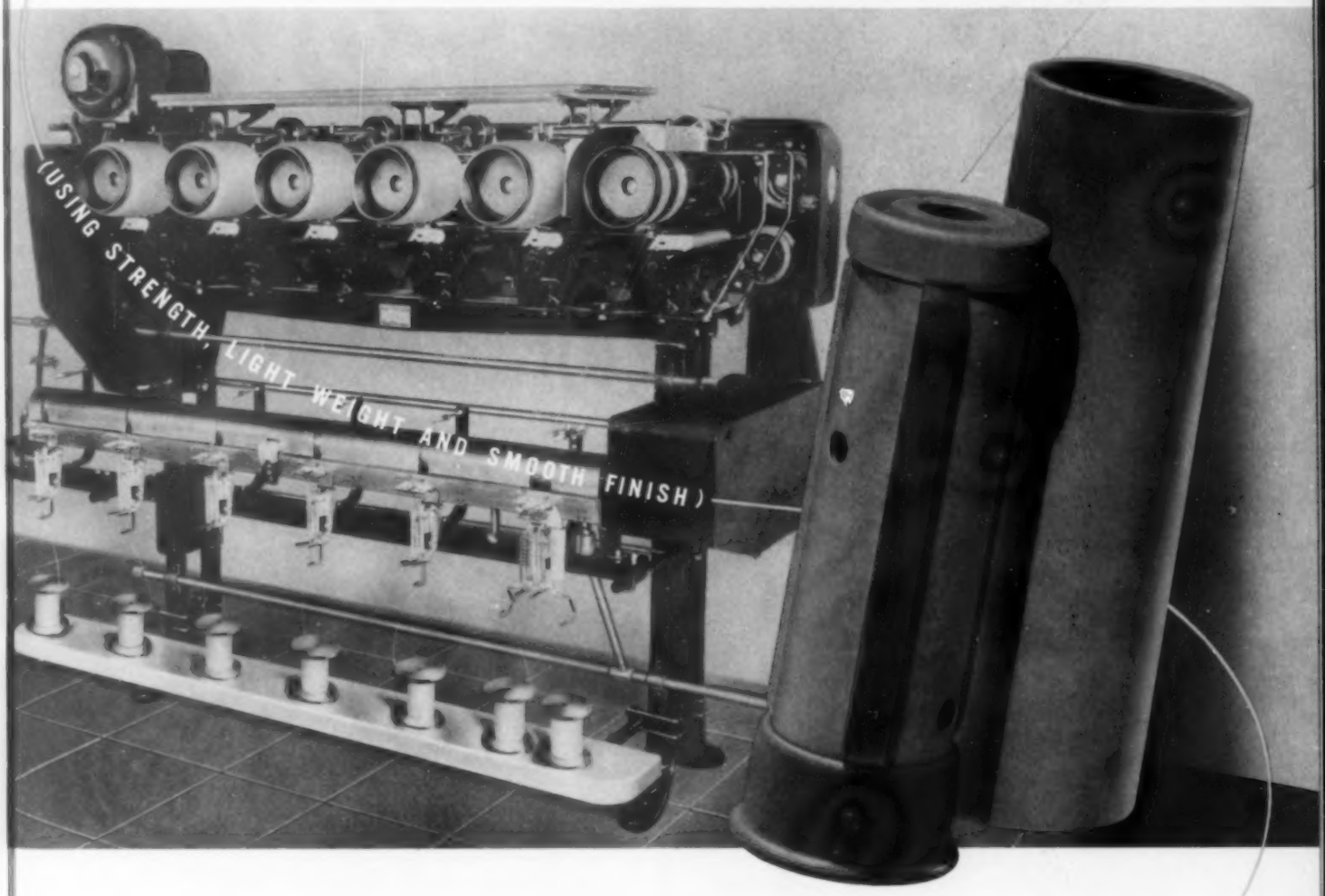
Plastics where plastics belong

Because of a unique combination of chemical, electrical, and mechanical qualities, Synthane laminated plastics can be applied to an endless number of practical purposes. Moisture and corrosion resistant, light-weight and structurally strong, Synthane has many collective advantages not readily found in any other material. One of the best electrical insulators known, Synthane is hard, dense, durable . . . quickly and easily machined.

Among the interesting occupations of our type of technical plastics are the redraw bobbin and chuck (below) used in winding fine denier nylon for women's hosiery.



Fine nylon filaments can be wound without pulling and sticking because of the smoothness of the bobbin. Light weight of bobbin and chuck allows the spindle to be started and stopped faster and with less effort. Greater crushing strength of tube permits larger amounts of nylon to be wound. This is an appropriate job for Synthane, an interesting example of using plastics where plastics belong.

If any of Synthane's many properties suggest a use for it in your plant, let us help you before you design. Write for our complete catalog of Synthane plastics today! Synthane Corporation, 8 River Road, Oaks, Pa.

SYNTHANE

where Synthane belongs

DESIGN • MATERIALS • FABRICATION • SHEETS • RODS • TUBES
FABRICATED PARTS • MOLDED-MACERATED • MOLDED-LAMINATED

ON THE BALL OR BEHIND IT?

With industry clamoring for better products, businessmen are leaving no material unexplored which suggests a better answer to their current requirements.

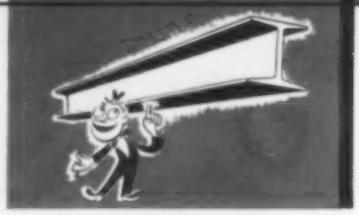
Our type of laminated plastics—Synthane—may be your answer to better products because it has not one, but many valuable properties *in combination.*

As an electrical insulator, Synthane is one of the best—high dielectric strength, low power factor, low dielectric constant. May be quickly and easily machined.

For example, you can depend on Synthane for tensile, compressive, flexural and impact strength. Compares favorably with metals on a strength-for-weight basis.

Synthane is the set plastic, stable over wide variations in temperature.

Light weight is one of Synthane's most useful properties. Weighs about half as much as aluminum, has ample strength for all electrical and most mechanical applications.



Perhaps one of these or other Synthane qualities suggest its use in your product. If so, let us help you before you design . . . we may be able to save you considerable time, trouble and money. Send for your free copy of the Synthane Plastics Catalog today!

● ● ● ● ● FOR MORE ANSWERS ON PLASTICS ● ● ● ● ●

SYNTHANE CORPORATION, 8 RIVER ROAD, OAKS, PA.

Gentlemen:

Please send me without obligation a complete catalog of Synthane technical plastics.

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SYNTHANE

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PLAN YOUR PRESENT AND FUTURE WITH SYNTHANE TECHNICAL PLASTICS • SHEETS • RODS • TUBES • FABRICATED PARTS • MOLDED-LAMINATED • MOLDED-MACERATED

PLASTIC BRUSH HOLDERS with metal inserts are molded to very close tolerances for the IBM Calculating Punch. This high speed, versatile business machine requires parts made with the utmost precision.

Brush holders molded by Plastic Manufacturers Inc. for International Business Machines Corporation.

PM
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PLASTIC MANUFACTURERS
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INJECTION • TRANSFER & COMPRESSION MOLDING • COMPLETE ASSEMBLY

FOR YOUR INFOR M ATION

NEW PRODUCTION FOR NEW MARKETS

Another major increase in the output of Resinox* thermosetting materials, scheduled for midsummer of 1948, highlights Monsanto's expanding plastics production facilities here in Springfield, Massachusetts. The Monsanto expansion since 1938 indicated in yellow on the aerial view above, is graphic illustration that (1) consumer demand is spurring the plastics industry to increasing growth and (2) that a wide range of versatile raw materials is available to help solve present industrial shortages.

Availability of plastics for industrial production is emphasized by the critically short supplies of alternate materials. The gray market in steel, tight supplies in lumber, shortages in many basic materials, all point to new markets and new profits for alert designers, manufacturers and merchandisers. Manufacturers can profit, for instance, in tough, thermosetting plastics. Merchandisers in saleswise plastic packaging. Designers through the color, adaptability, utility of plastics.

The fact that the plastics industry now is ten times its size ten years ago indicates a substantial and continuing demand for the products of molders. Present shortages promise new markets to benefit both molders and material-short industries.

The range of Monsanto plastics is wide enough . . . versatile enough . . . to solve many industrial material problems resulting from present shortages. Let Monsanto help *you* find the plastic which will meet *your* needs. The coupon will bring you complete information on the plastics helpful to you. *Reg. U. S. Pat. Off.

SERVING INDUSTRY . . . WHICH SERVES MANKIND

News about Plastics from Monsanto Chemical Company | **MARCH...1948**

NEW CATALOG OFFERS YOU LATEST PLASTICS PRODUCT INFORMATION

New information on recent developments in raw materials is combined with *detailed summaries of all* Monsanto plastics in the current edition of the Monsanto Plastics catalog just off the press.

Makers and buyers of plastics materials or end products will find the book invaluable for a quick summary of plastics designed for their problems with materials or end products. Each Monsanto product is explained in terms of general physical properties, characteristics, fabricating methods and the forms in which it is supplied. Further detailed information for *each* product includes: What It Is, What It Offers, Where It Is Used.

Molders reading the book can start with the physical properties they require and find almost invariably the plastic to fit their needs exactly. Typical properties applicable to the family of Monsanto plastics include heat-resistance, transparency, adhesive and electrical properties, color, rigidity, resistance to chemicals, weathering characteristics, resiliency, dimensional stability, impact and flexural strength.

New Edition Explains Production, Materials and Special Aids for Molders

The new 1948 catalog outlines Monsanto's products as well as Monsanto's facilities for helping solve many of the problems involved in materials, methods and design. The catalog explains how molders, designers and end-users can get advice on materials selection, production technique and product styling together with on-the-spot assistance by technical consultants who have years of practical experience in the field. The catalog also explains how the Monsanto Plastics Technical Council, made up of experts representing all basic factors of plastics application, uses basic research, material development and long experience with plastics properties to find the right plastics for specific production needs. Merchandising counsel is also available as fully explained in the new book, "What Monsanto Plastics Can Do For You."

USE THIS COUPON TO BRING YOU THE MONSANTO PLASTICS CATALOG

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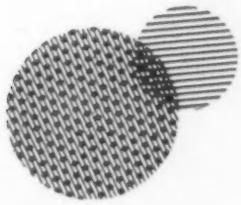
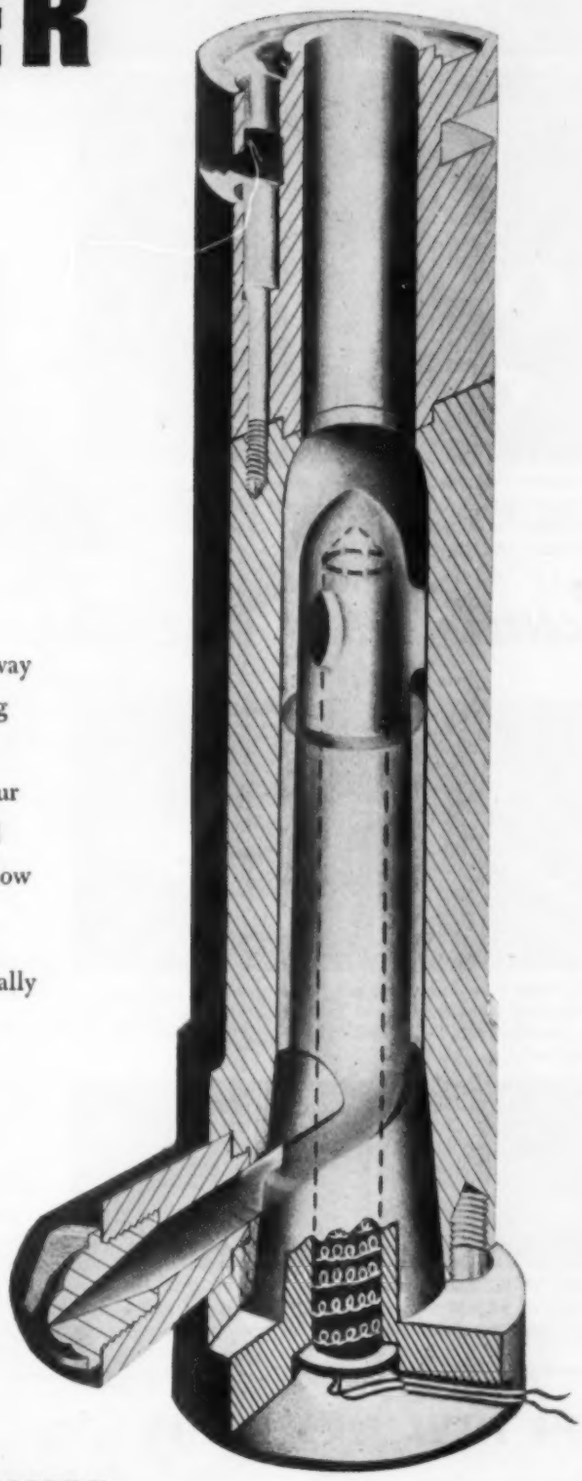
LESTER

ANOTHER THERMOPLASTIC TO A LESTER CYLINDER





Every thermoplastic material behaves in a different way when it is being molded. But to a Lester Injection Molding Machine, they are all the same. If you want to mold Nylon, call upon the years of experience of our engineering department. The same ingenuity and skill which has produced the internally heated cylinder, will show you how to mold Nylon successfully.

Write today for a reprint of the articles "Improved Internally Heated Cylinder" and "Injection Cylinder Design".

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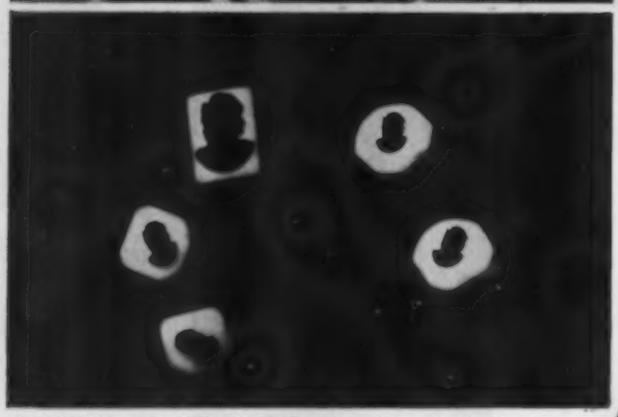

JEWELRY THAT "GLOWS" in the dark, including matching earrings and chatelaine, were made by Bloomfield Plastics Artcraft using regular Lucite and phosphorescent Lucite (duPont).

"Glowing" BEAUTY

"Luminous" Plastics Add Beauty and Utility to Plastic Products

One of the most popular "luminous" commercial items continues to be this phosphorescent polystyrene flashlight. The housing is molded for Delta Electric Co. of Lustron (Monsanto Chemical Co.).

"Luminous" RELIGIOUS items are a natural. Molded by Emeloid Co. of phosphorescent cellulose acetate and polystyrene molding compositions from Manufacturers Chemical Co.

PRACTICALLY anything that's made of plastics — or contains plastics in part—can be made "luminous", too. Jewelry, wall plaques, religious items, and house numbers are but a few of the hundred-and-one† applications. Other uses include such practical products as clocks, flashlights, lamps and lampshades, switches, switch plates and shields, table tops, safety signs and markers, toys, gifts and novelties.

Why not investigate the application of luminescent pigmented plastics to your products? We shall be glad to work with you, and tell you who can supply you with "luminous" plastic compounds.

† Send for a copy of our booklet "101 Useful Luminescent Applications."

* Reg. U. S. Pat. Off.

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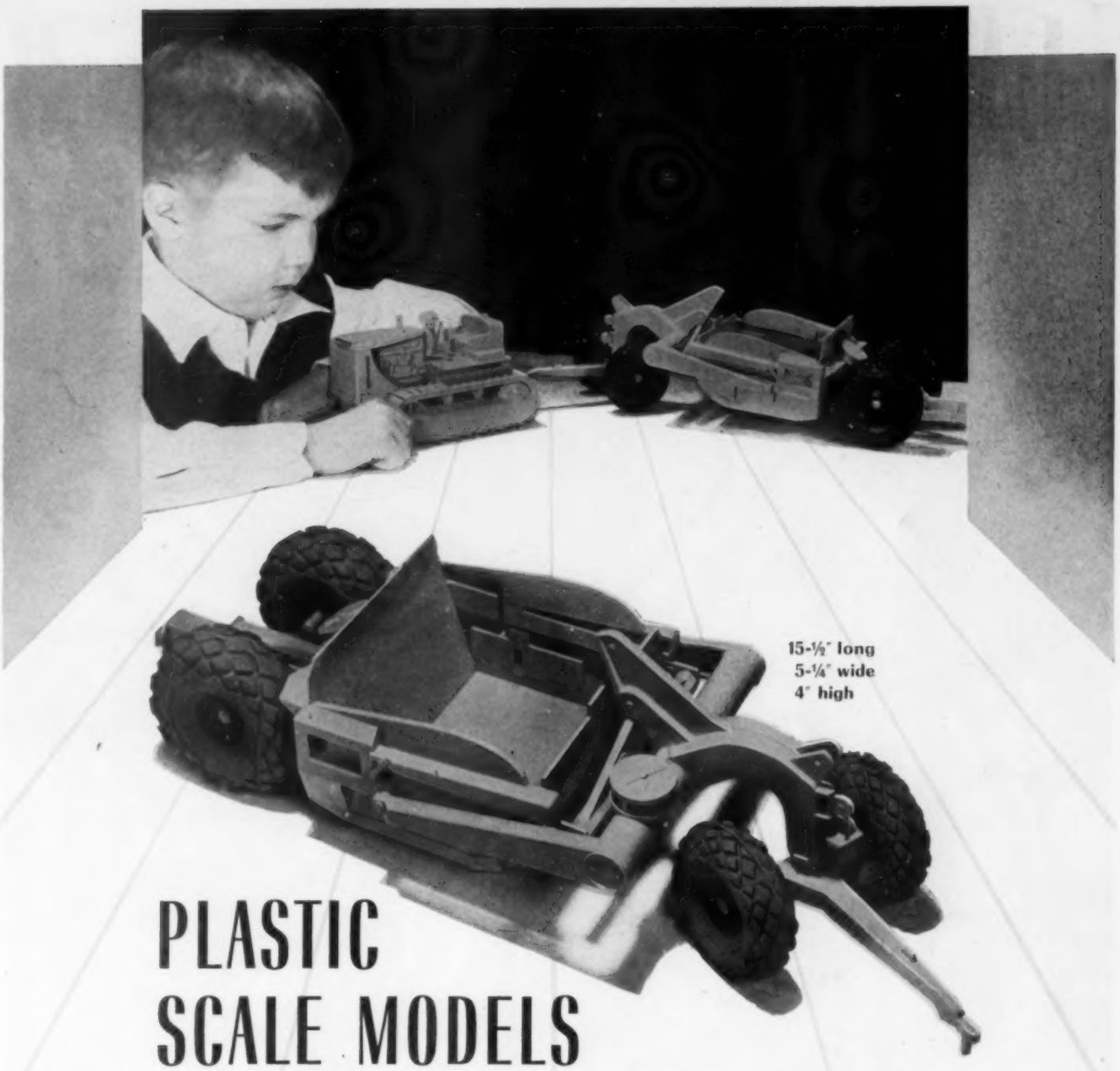
New Jersey zinc

THE NEW JERSEY ZINC CO. • **160 Front Street, New York 7, N. Y.**

It's **Horse Head* Luminescent Pigments** *that* ***MAKE*** *these Plastics "Glow"*



15-½" long
5-¼" wide
4" high

PLASTIC SCALE MODELS

Another scale model designed by Cruver for the Caterpillar Tractor Company of Peoria, Illinois.

The Number 70 Road Scraper model is in the same scale (1:24) as its companion, the D-7 Tractor.

In "Hi-Way Yellow" acetate, this replica is an example of fine molding detail and is complete even to genuine rubber tires in the same scale.

Your plastic problems, regardless of complexity, will be solved by the same staff responsible for engineering this Caterpillar scale model.

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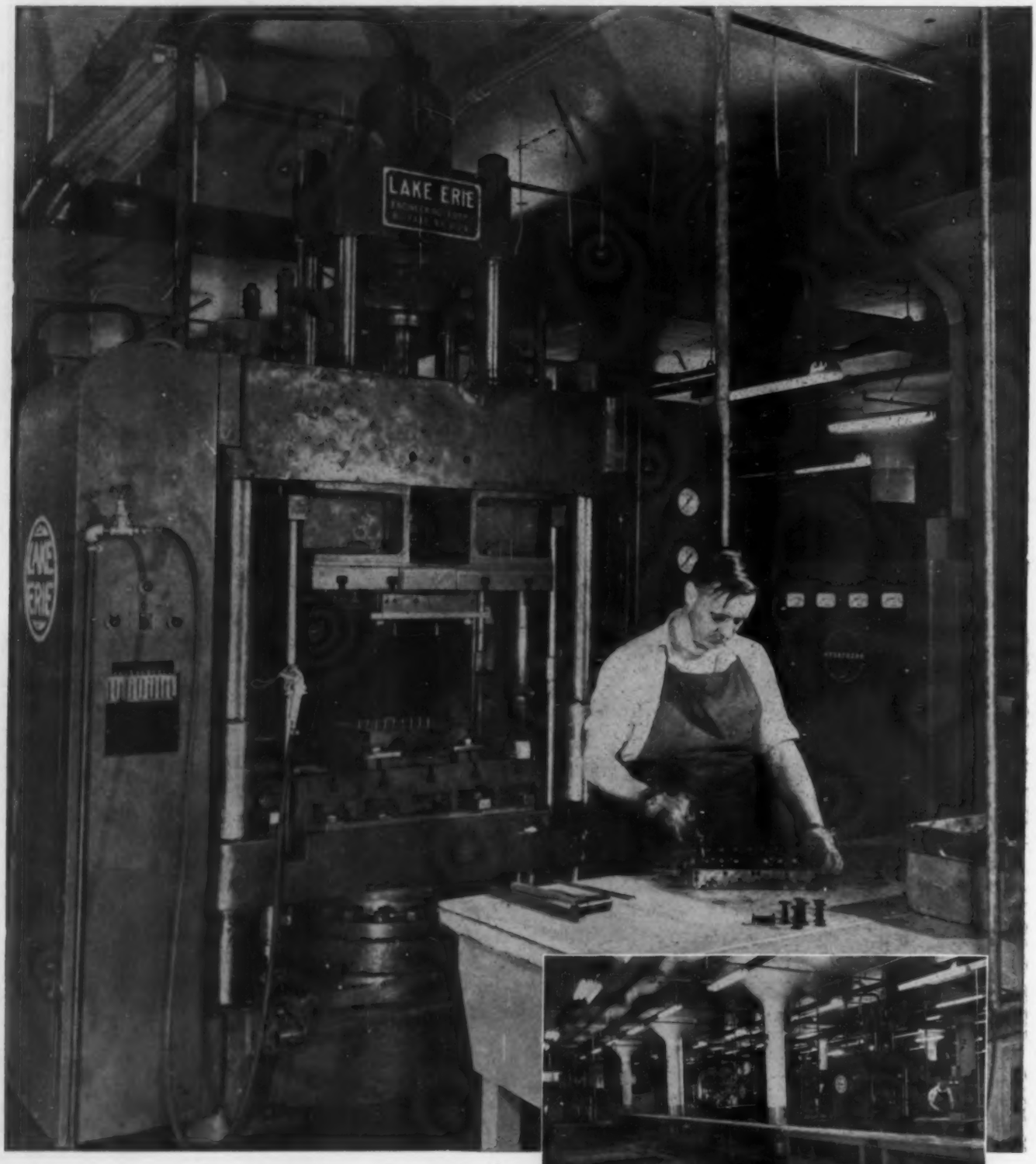
LAKE ERIE Duplex Presses

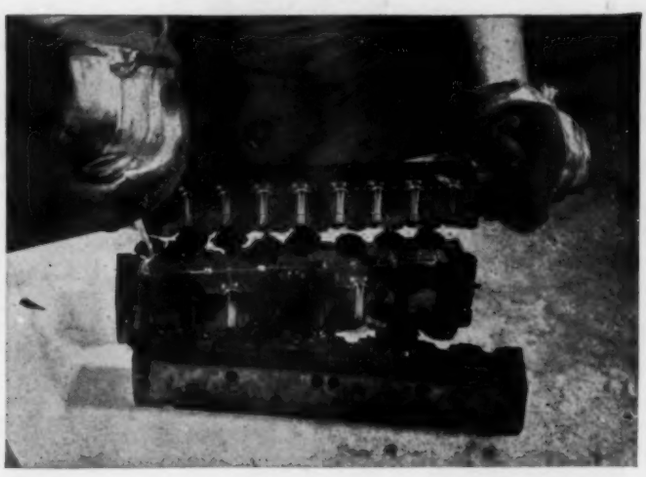


ABOVE—A 300-ton Lake Erie Duplex Press molding spools used in desk telephone sets. Spools were formerly molded on a single action press... new method is much faster.

RIGHT—Four new Lake Erie Duplex Molding Presses (1-300 ton, 1-200 ton, 2-100 ton) in operation in the Federal Telephone and Radio Corp. plant. Four more Lake Erie presses on order will be installed in the open spaces shown in foreground.

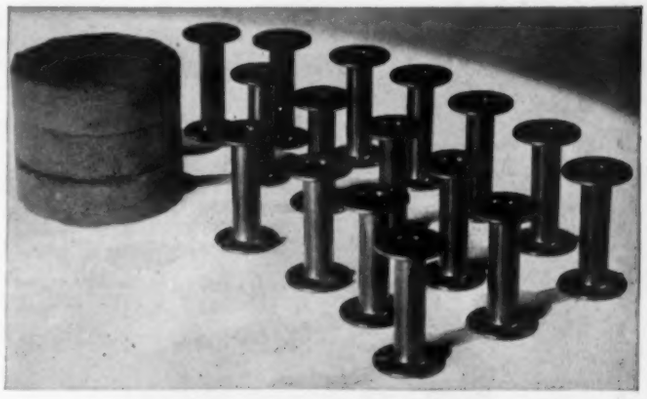
Boost Plant Output for Federal Telephone and Radio

Removing mold from press. The Durez preforms are preheated on a Megatherm Electronic heater designed and produced by Federal Telephone and Radio Corp.



Removing spools from mold. Quality of spools is better and rejects and waste have been reduced with new Lake Erie Duplex Press on the job.

GREATER molding speed is but one of the many advantages of the four new Lake Erie Presses placed in service by Federal Telephone and Radio Corp. In addition to increased production, quality of molded parts has improved, rejects and waste have been reduced and unit costs have been brought down. These benefits are made possible by continuing advances in molding techniques and press designs. At Lake Erie, press designs are based on alert research that combines the best thinking of progressive molders and our own experienced engineers. That's why more and more molders are selecting Lake Erie presses... why many are replacing older, outmoded presses with the latest Lake Erie equipment.



Spools, also called ringer bobbins, ready to be wound with wire prior to installation in telephone. This is but one of many parts molded on Lake Erie Presses.

● Leading manufacturer of hydraulic presses—all sizes and types—plastic molding... metal working... forging ...metal extrusion ...processing... rubber vulcanizing... stereotyping... special purpose.

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IBM calculator relay. High dielectric strength housing contains 11 metal inserts, each one precision placed.

Calculator gear. Contains numerous under- and over-cuts. Concentricity variation held to .002". Molded to withstand extreme torsional stresses.

Have you a part other molders will not even attempt to produce because it contains too many inserts?

Do you need molding done to exacting specifications?

Are special dielectric properties included in your requirements?

Then bring that tough assignment to us. As the second largest compression molder in the world, we utilize our enormous know-how to turn such jobs out successfully, even if production has been termed "impossible" by other molders.

We mold with "Colasta", our own specially developed phenolic molding compound, which may be formulated with precise dielectric properties. "Colasta" also has excellent dimensional stability and minimum moisture absorption. Hence, it is an ideal material for making all electric and electronic parts and fixtures.

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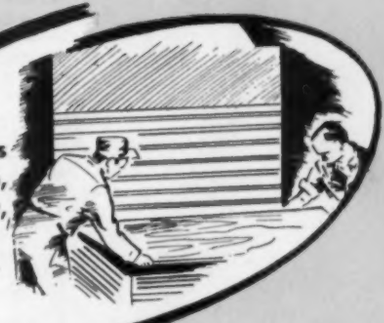

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- Cellulose Plastics, Part I
- Cellulose Plastics, Part II
- Acrylic and Polystyrene Resins
- Polyvinyl Resins and Their Characteristics, Part I
- Polyvinyl Resins and Their Characteristics, Part II
- Miscellaneous Resins, Polymides
- Synthetic Rubbers and Rubber-like Materials
- Utilization of Farm Products and Vegetable By-Products
- Physical Properties of Plastics, Part I
- Optical Properties of Plastics Materials
- Molding of Plastics—Preparatory Measures
- Compression and Transfer Molding
- Compression Molding and Equipment
- Injection Molding—Part I
- Injection Molding—Part II
- Extruded Plastics and Their Applications
- Developing Heat and Pressure for Molding
- Design of Compression Molds
- Design of Transfer and Injection Molds
- Design of Molded Plastics Parts—Part I
- Design of Molded Plastics Parts—Part II
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Versatile Elmes hydraulic presses—designed with an eye on tomorrow—are *ready today* to help you cut compression molding costs.

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Compact arrangement. Integral power. Convenient push-button panel. Elmes all-purpose presses bring you *every excellent feature* for accurate, economical work.

Standard Elmes semi-automatic-type compression molding presses are made in capacities from 100 tons, up. Furnished with or without coordinating control for high-frequency preheating unit. Press head is arranged to permit addition of a standard transfer cylinder later, if desired, without dismantling installed equipment.

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The 6" Gordon Plasticator with die head open, showing strainer plate.

for blending plastics

Designed specifically for continuous mixing of the various powders or granules that go into numerous thermoplastics, this machine performs three successive operations which assure thorough blending in a single pass.

This triple mixing action combines and works partially preblended mixtures of thermoplastic resins, fillers, plasticizers and coloring matter, and extrudes the stock in a continuous strip.

The screw which conveys the stock through a cylinder, jacketed for temperature control, has a section of forcing thread at the feed end, followed by a plasticating thread. In this intermediate area, where the screw is smaller in diameter, the forward motion of the stock is retarded and the mixture allowed to work in the space between the top of the thread and the cylinder wall. Beyond this point the thread diameter is again increased to force the stock between a stationary plasticating head and a revolving cone. This results in an intensive milling action on the material as it progresses toward the die head. Just before extrusion through the die, a screened strainer plate provides a means of breaking up any minute particles which might remain.

We shall be glad to supply complete information on this continuous production unit or on any of the other plastics processing machines listed on this page. FB-345

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Height 50" — Depth 28½"
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Thermostatic Control 100° to 300°F.

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Double Door: Width 48"
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Model No. 3 is two Model 2 units placed one above the other. They can be operated independently of each other and the top unit can be used in reverse position whenever desired.

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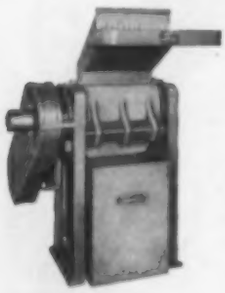

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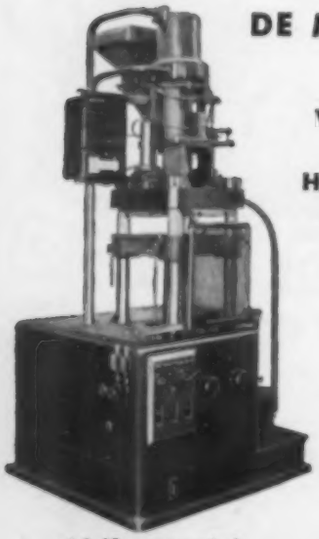

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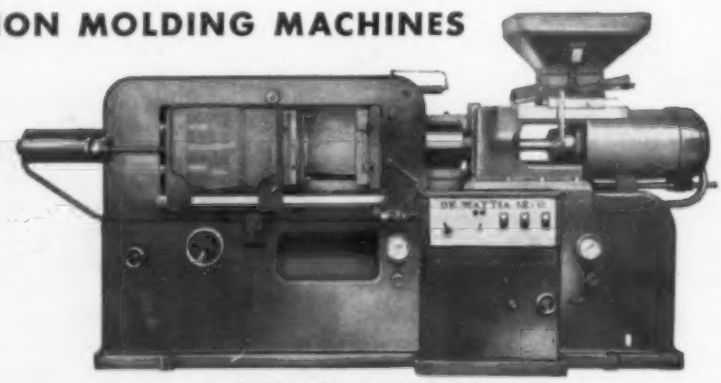
THE VERTICAL MACHINES HAVING HORIZONTAL PLATENS ARE PARTICULARLY ADAPTABLE TO INSERT WORK.



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● Shown above are four successful examples of molding by Prolon Plastics which demonstrate the results obtained by careful planning and scientific production control. Specialized facilities and specialized knowledge make Prolon Plastics your best bet when you have an exacting plastics problem involving large or small pieces . . . by injection *or* compression. Progressive thinking gives you more for your money at Prolon Plastics.

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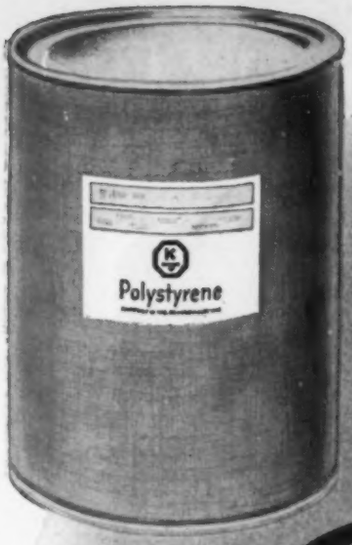

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Polystyrene
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Ethyl Cellulose

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To further guide you in the selection of the right plastic, Koppers has developed a new chart, "Properties of 17 Popular Modern Rigid Plastics." Use the coupon to get your free copy.

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CHEMICAL DIVISION
Pittsburgh 19, Pa.

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MP3

KOPPERS COMPANY, INC.
CHEMICAL DIVISION
PITTSBURGH 19, PA.

Please send me a copy of the chart, "Properties of 17 Popular Modern Rigid Plastics."

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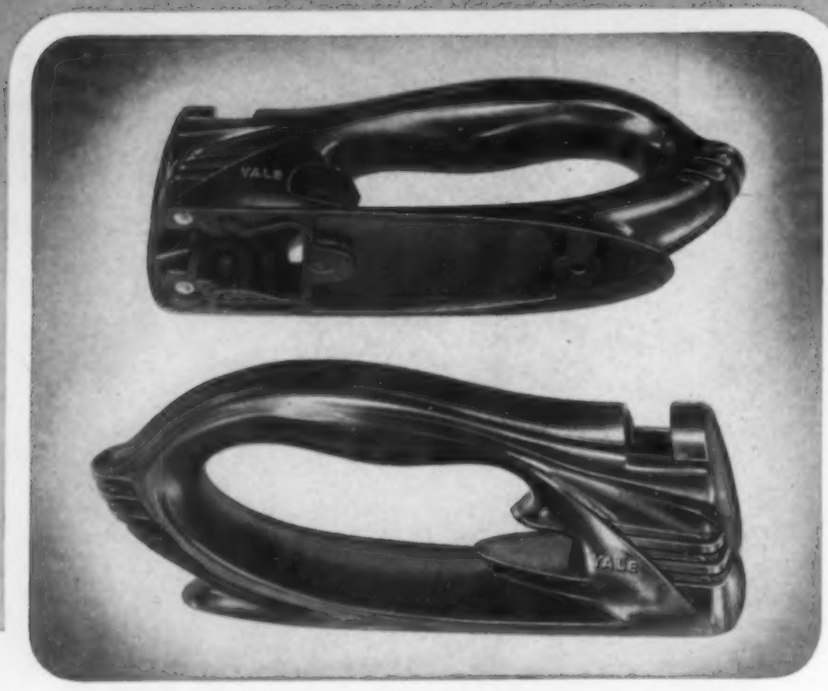
SHAW STANDS ON TIPTOES



Yale's new iron tiptoes smoothly and carefully through the most complicated curtain flounces. The user may never know it, but Shaw "stood on tiptoes" to work out the mold design for the iron's handle.

Intricate side cores, inserts and finely sculptured parting lines posed difficulties that called for a real achievement in molding technique. To mold this handle at low cost in large volume, Shaw employed a four cavity, automatic Transfer mold operating on a very fast cycle.

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Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

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You may be searching at this moment for a material that will help you enhance the appearance of a product . . . add sparkle to a novelty or display . . . or handle an insulating job on high frequency equipment. Turn your attention to Plax polystyrene or methacrylate rod.

Both of these Plax products are enjoying wide usage in a variety of fields. Plax polystyrene rod, available in round, square or twisted shapes, is used in high frequency insulation, chemical applications, novelties, display pieces and for many general industrial purposes. Plax methacrylate rod also offers a diversity of applications.

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The pumps are constant stroke type, are fitted with Aldrich synchronized suction valve control and have 200 HP, 200 RPM engine type synchronous motors mounted directly on the crankshaft. The installation is unique in that the pumps and motors operate at the same speed.

In still another installation, where pumping requirements are not as great, Aldrich-Groff "POWR-SAVR" Variable Stroke Pumps are being used to perform a similar service. With these pumps, the stroke can be automatically regulated to deliver desired capacity while maintaining uniform pressure in the hydraulic system to within 3% variation.

So, whether your job involves record pressing, plastic molding or die casting, one of the high pressure pumps offered by Aldrich should be able to meet your requirements. For information write to:

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ONLY PHILLIPS CROSS RECESSED HEAD SCREWS

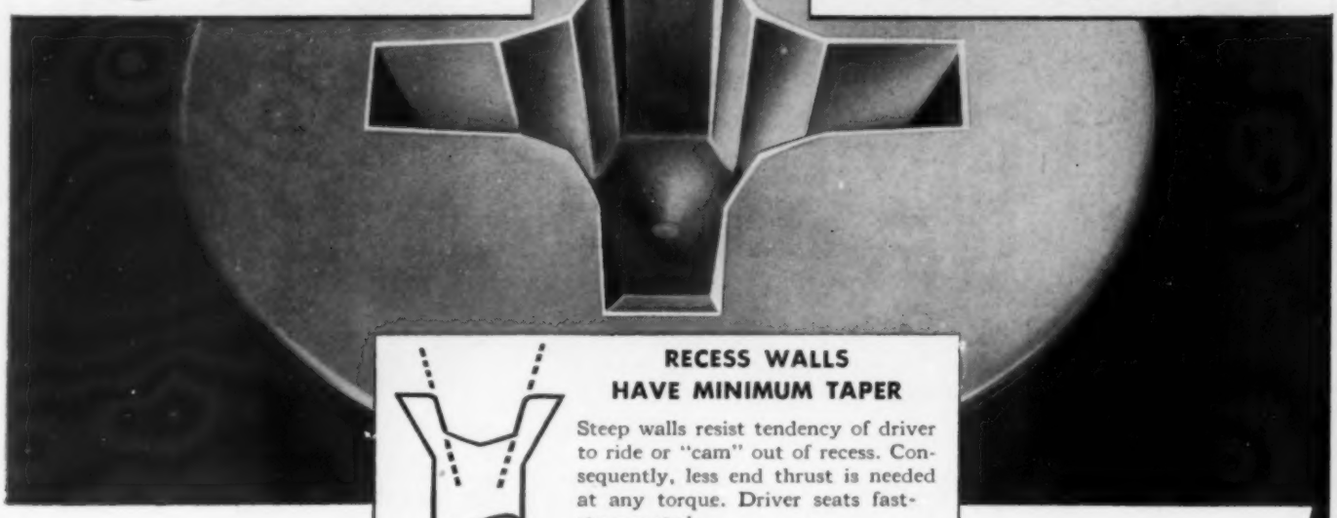
ARE ENGINEERED FOR PRACTICAL PRODUCTION DRIVING

RECESS EDGE ROUNDED AT TOP

Prevents pushing up burrs because contact with driver begins just below top surface of screw head. Easy for driver to "ride in" to a firm seat, without excess strain on driver point wings.

WIDER OPENING AT RECESS CENTER

Absence of sharp corners provides wider center opening. This recess shape aids self-centering of driver. It also permits driving tool contour that insures maximum strength.



RECESS WALLS HAVE MINIMUM TAPER

Steep walls resist tendency of driver to ride or "cam" out of recess. Consequently, less end thrust is needed at any torque. Driver seats fast-stays seated.

LOOK CLOSELY at the Phillips Recess. No sharp corners to burr easily — require slowed-down, fussy starting — or to "beat up" bits.

Phillips Engineers shaped this recess according to job conditions, not on abstract theory. They know assembly workers are fast moving, often "heavy-handed," cannot always be as fully trained as desired.

That's why Phillips Recessed Head Screws not only promise, but *deliver* all advantages of the cross recessed head on any assembly job.

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . . GET

GET THIS NEW BOOKLET to guide you in selecting the right cross recessed head screws for your assembly . . . "Why Phillips is the STANDARD Cross Recessed Head Screw". It's free.

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Presents **EXAMPLES OF FINE WORKMANSHIP**

#1

OF A SERIES

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The precision molded, jewel-like prism at the base makes the reading possible. This plug is an accomplishment in sound engineering and economical molding for functional beauty.

This plug is molded, printed and assembled for the National Battery Company of St. Paul, Minnesota.

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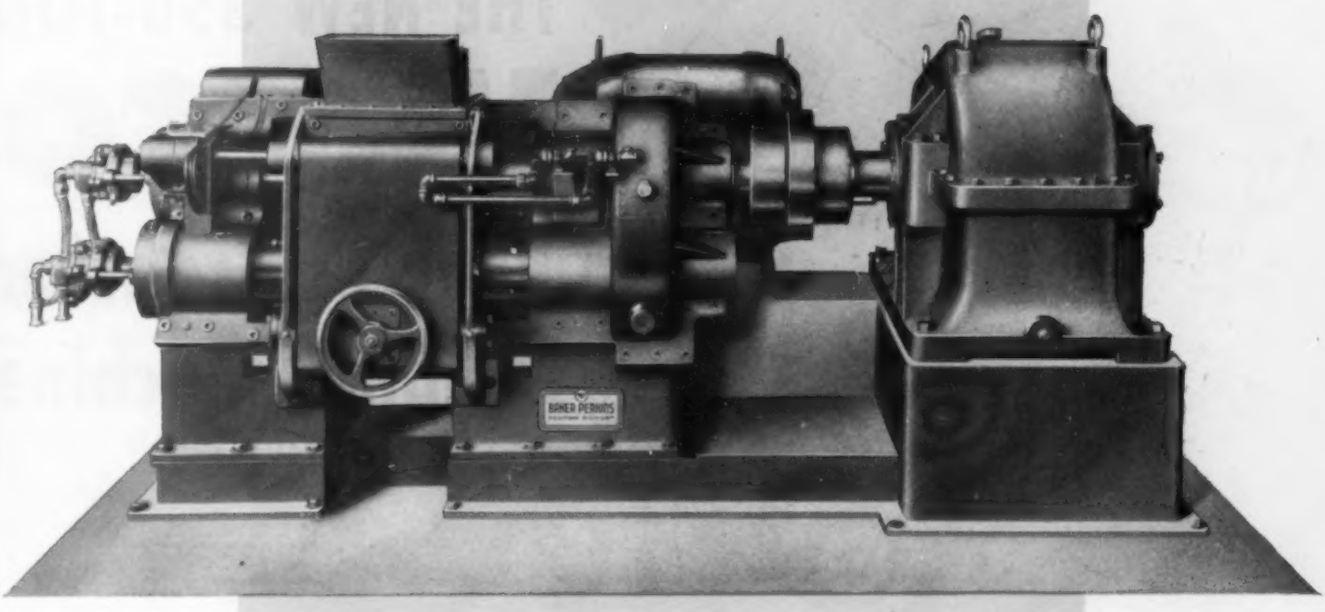
Announcing

the remarkable new

BAKER PERKINS MASTICATOR

Engineered specifically for the efficient compounding of plastics with pigments and fillers



The new-type masticator blades are cored for the circulation of cold water or brine for uniform cooling of the blade surface. Because of their unique design *these new blades constantly draw material down into the mixing zone* thereby eliminating need for ram or compression cover. Jacketed mixing trough and blades are cooled by means of a newly developed high pressure, high velocity system *which results in more efficient cooling* than has heretofore been possible in this type machine. Many other features make the new Baker Perkins Masticator today's most up-to-date production mixer.

BAKER PERKINS INC.

CHEMICAL MACHINERY DIV.

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Here's the fastest machine of its type on the market

THE NEW 350-TON IMPCO Plunger or Transfer Molding Machine

PLASTIC MOLDING MACHINERY DIVISION

Improved **PAPER MACHINERY CORPORATION**

NASHUA • NEW HAMPSHIRE

Here's why the Impco is faster... more productive

The 50-ton high speed plunger or transfer cylinder is located *beneath* the stationary platen. This means quicker loading of pre-forms, quicker cull removal, shorter plunger travel. Because of these advantages, pre-forms may be heated to a higher temperature adding up to considerable saving in time . . . more production.

350-ton Clamping Pressure
50-ton Plunger or Transfer Cylinder . . . or a 7 to 1 ratio
(as against the usual 5 to 1 or less).

Pressure on both may be adjusted to suit conditions as they are powered by separate pumps. This cannot be accomplished by any similar machine equipped with only one pump.

The top platen can be stopped instantly in any position . . . *positive* safety devices will *not* let the machine close until the *safety gate is down.*

Let us give you the *complete* story. Write us today or plan to see it in Nashua.

This machine is also built in 50-ton capacity.

MP-7

First IN THE HIT PARADE.

New styling . . . new design . . . new "eye appeal" . . . here today are tomorrow's radio cabinets—used by America's leading radio manufacturers—precision molded of colorful, practical plastics by General Industries.

In both phenolics and styrene—alone and in various cabinet and grille combinations—they are produced economically on a mass production basis by General Industries' modern extensive facilities for compression and injection molding. And in these, as in all GI molded plastics parts, competent engineering assistance, rigid quality control, and thorough testing and inspection combine to insure highest quality in the finished product.

Whatever your requirements, you're bound to profit when you come to The General Industries Company—where experience gained through 25 years of molded plastics leadership is waiting to serve you.

FOR THE *BEST* IN MOLDED PLASTICS

TABLE-MODEL

Radio Cabinets

BY

GENERAL INDUSTRIES

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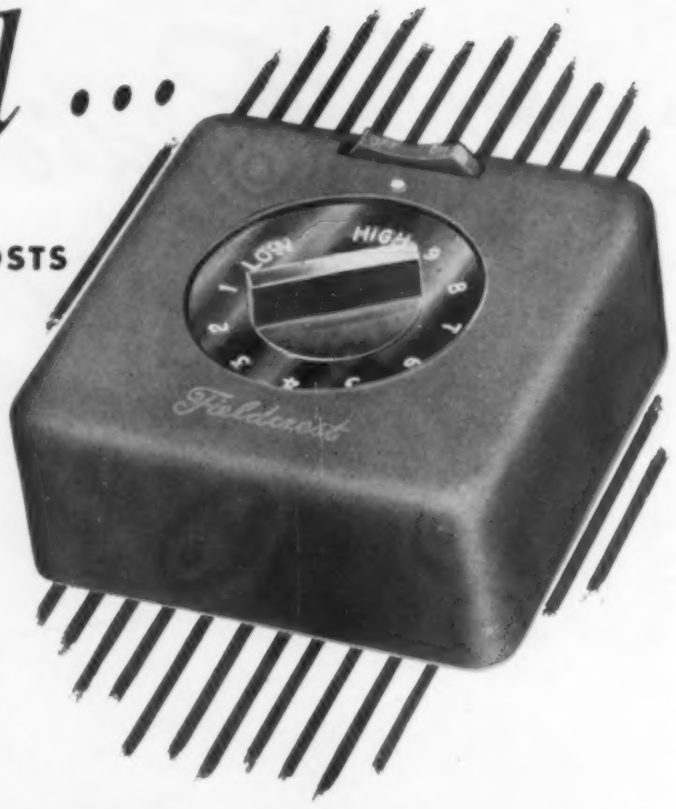
MOLDED PLASTICS PIONEERS

DEPARTMENT R • ELYRIA, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Control ...

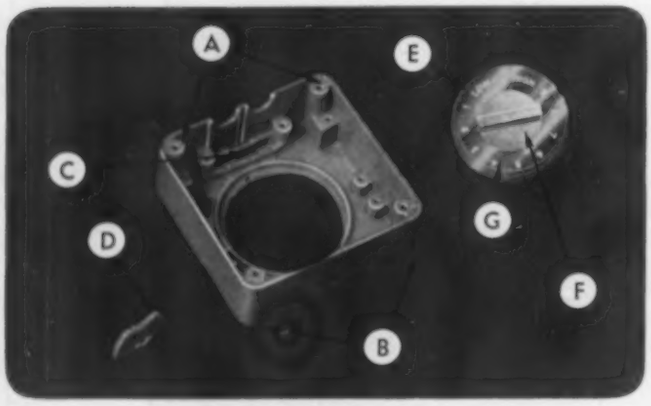


STYLING AND PRODUCTION COSTS WITH MOLDED PLASTICS

This control unit, produced by Thomas A. Edison, Inc. for the famous Fieldcrest Thermostatic Blanket, is an outstanding example of how top styling and cost-cutting utility can be combined through the use of molded plastics.

Today's increasingly competitive market makes this union of eye-appeal and utility . . . at low production costs . . . an extremely vital consideration in the successful marketing of nearly any consumer item.

More and more manufacturers are turning to AICO plastics for the properties that will place their products in a more favorable competitive position.



A major cost in the manufacture of this thermostatic control . . . assembly of its many internal parts . . . is minimized by accurately placed shoulders, bosses and holes (A) which are ready for fabrication as they leave the mold. Rounded streamlined corners (B) are produced in the same way. Slot (C) is shaped to fit the arc of the off-on rocker (D). The transparent dial (E) is molded with a gold finished metal insert (F). Depressed numbers (G) are filled with white pigment. Housing and rocker are of translucent urea because it provides a hard, lustrous finish at low cost. An internal light illuminates the temperature setting through the clear methacrylate dial. All parts are produced in multi-cavity semi-automatic compression molds.

Our portfolio of Aico Plastics Applications shows many actual uses of molded plastics. It contains pictures and informative descriptions to help guide you in designing for the practical application of plastics to your product. Aico's 32 years of precision molding experience, is at your service to help solve any problem that may arise.

AMERICAN INSULATOR CORPORATION
New Freedom, Pa.

AICO PRECISION MOLDING *for over 32 years*

MANY THINGS ARE BETTER BECAUSE OF PLASTICS

VOLUME 25 MARCH 1948 NUMBER 7

MODERN PLASTICS

"Operation Underfoot" ...Vinyl Floors

A single new use of vinyl resins promises to consume huge quantities of this plastic. Hard-surfaced floor coverings in a wide market range are being made by several companies using a variety of techniques

OVER a year ago an officer of one of the biggest linoleum manufacturing concerns in the world made a following statement to MODERN PLASTICS: "Any manufacturer of hard-surface flooring who ignores this vinyl flooring development is placing his future markets in jeopardy!" He referred to roll and tile flooring made from compounds of vinyl resins with fillers, binders, and plasticizers, and designed to take advantage of the qualities of those resins. The statement was made some time before the U. S. Stoneware Co. announced the first commercial development of laminated vinyl tile.[1]

In the time since that statement was made, independent research and field testing, begun several years ago by at least six leading makers of linoleum, asphalt tile, and rubber tile, and by a number of smaller concerns including some in the plastics field, has been pushed to successful conclusions. Result: there are 14 makes of vinyl flooring on the market today, several of them backed by important brand names in the hard floor-covering field. At least four more will be put into commercial production this year.

The 14 makes now available generally differ in resin base, formulation, pigmentation, and finish. They are in several price ranges, competing with each other and with one or another of the established range of hard-surfaced floorings: rubber tile, battleship linoleum, inlaid linoleum, and even asphalt tile in the greaseproof and light-colored grades. In each case the vinyl product is more costly

[1] "Laminated vinyl tile flooring," MODERN PLASTICS 24, 123-125 (April 1947).

Vinyl floor covering produced by Goodyear can be installed in strip or tile form. The latter style is shown below

When installing Goodyear vinyl flooring in strip form, a double platen, electrically heated, softens the material to aid cutting

Promenade deck of the liner "President Cleveland" shows an application of a special Sloane-Blabon vinyl tile. The individual tiles are diamond shaped, each containing four raised diamond areas with gutters between them. These gutters are too narrow to catch high heels, wide enough for easy removal of debris

than its established competitor but offers advantages in color quality and resistance to acids, alkalis, wear, abrasion, and indentation.

Broad competition

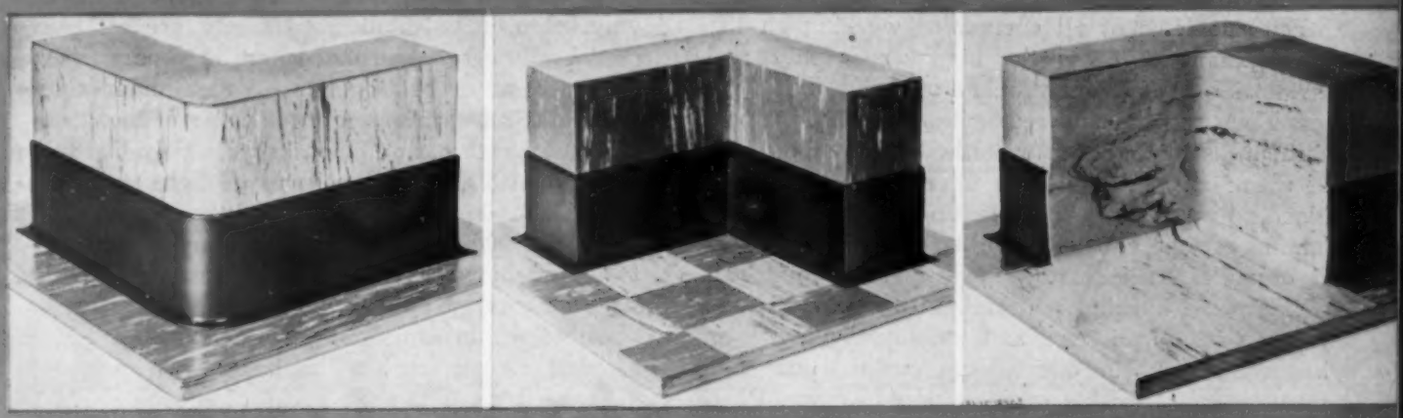
Possibly the reason for this widely competitive range of vinyl floorings is that the development has been largely in the hands of flooring makers with established channels of distribution, each seeking to round out his line and broaden his market either by hitting where his competitor was weakest or by developing an exclusive product outside of the normal competitive range. Under the Building Materials and Structures tolerance specifications set by the National Bureau of Standards, competition in hard-surface floorings has become a matter of style and promotion at any value level. The vinyl floorings, each built to beat one or more of these specifications, but not restricted to a single standard, will make for more vigorous merchandising of all floorings. In short, this application has up-graded the whole hard-surfaced flooring field and will extend its markets.

While production statistics and market estimates in the field are both scarce and confusing, there is no doubt that a prodigious sales potential exists in both household and commercial installations.

In 1936, according to a U. S. Department of Agriculture survey, the average family spent $12.33 a year on linoleum and felt-base flooring coverings. At 1947 prices the figure would probably be at least $15.

Trowling the adhesive over a previously cured concrete floor, just prior to applying the Sloane-Blabon vinyl tile

Thorough rolling of the surface is recommended by Sloane-Blabon to assure complete adhesion of cement to tile and under-floor



Flash type cove bases can be formed from Goodyear's sheet vinyl flooring. Also produced is an extruded cove material which can be applied to both inside and outside corners. In either type the material can be readily fitted to contours after warming

Given over 44,000,000 families, 12,000,000 of them established within the past 10 years, a low total potential for this market would be $660,000,000. All hard-surfaced floorings are relatively durable, but if some householders can be persuaded to pay more for an even more durable product, plus the other advantages of vinyl, this figure can be greatly increased. Uneven wear, always a problem with linoleum, is almost impossible with properly compounded vinyl floors. Tests show that the lowest-priced vinyl flooring on the market will outlast ordinary hard-surface floorings of the same gage many times over. And while linoleum is acceptable as a flooring for rooms other than kitchens, breakfast rooms, bathrooms, and recreation rooms, the warmth, finish, colors, and high styling of vinyl floors make them distinctly attractive for living room, dining room, and bedroom use. A recent survey by *American Home* indicates that floor color is the key to modern home decoration. The vinyls permit color in abundance.

Commercial possibilities

In the commercial field, a single example will point up the possibilities. According to a modernization survey of men's wear stores made in August, 1947 by *Men's Wear,* 45% expect to renew store flooring soon, and even more of the big stores (61% of all doing over $500,000 a year volume) will do so. The survey is explicit as to what these stores expect to buy: carpet 31%, asphalt tile 24%, linoleum 17%, rubber tile 13%, terrazzo 8%, cork tile 5%, wood 2%. In order of importance their requirements in flooring characteristics are: eye appeal 31%, durability 30%, ease of maintenance 25%, underfoot comfort 11%, noise absorption 3%. Vinyl floors are superior in the qualities wanted by these stores. They also can be laid in any design to conform to architectural requirements.

Last year's exports of felt base flooring ran more than 350% over 1941 figures while linoleum exports were fully 250% above 1941. In both cases production is 20% over 1941, but exports erase the gains, and shortages persist. Linseed oil, the basic ingredient of linoleum, is subject to violent fluctuations in supply and price. Adding it all up, the vinyls offer some possibility of general cost and market stability to the flooring maker. Small wonder that one company has a target of 7,000,000 to 8,000,000 sq. ft. in 1948!

The contracting distributor of floorings also welcomes vinyl. All the types offered are as easy to apply as ordinary floorings, and even faster because they are more flexible. All are priced slightly higher than competing floorings, and thus allow a better profit. All have a quality appearance, regardless of the price — a factor which is quite important in trading up on a sale.

A good example of this competitive factor is the Johns-Manville vinyl tile selling at a price to the floor contractor which enables it to compete with rubber tile at 65 to 70¢ a sq. ft. installed. The vinyl tile is so easy to lay that it may match installed price of rubber tile on big jobs. Another example, at a different level, is the Delaware Floor Products Inc. vinyl flooring, "Flor-Ever," at $1.87 a sq. yd. to the retailer and about $3.00 a sq. yd. to the consumer (depending on the sales zone), which meets the price of ⅛-in. inlaid linoleum.

Pioneer installations

The first vinyl flooring was made in 1933 by Johns-Manville at Waukegan, Ill., from Vinylite resins for the "Vinylite House" at the Chicago World's Fair. It was walked over by 19,000,000 pairs of feet in two years, then taken up and re-installed in Bakelite Corporation's laboratory in Bound Brook, N. J. It has shown no signs of wear to date! Commercial in-

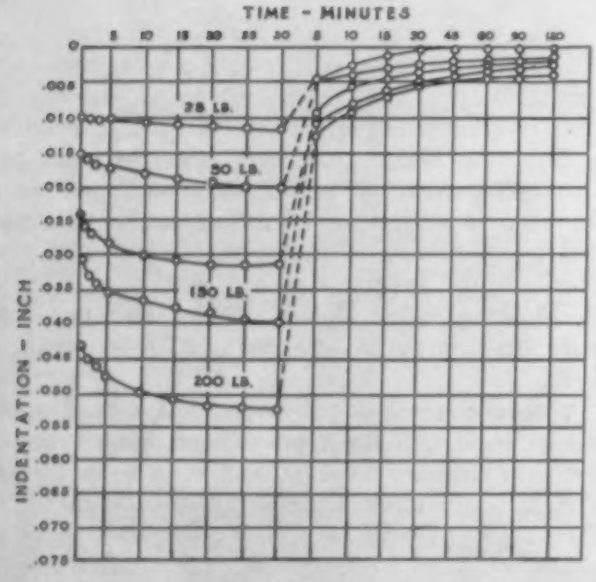
stallations were made as long as 10 years ago and are still in good condition.

But problems of all companies working on the development of vinyl flooring were plenty and serious. So big was the problem of shrink that some manufacturers have overcome it only within the past six months by one of four methods or combinations of them: a) use of proper fillers, b) use of non-bleeding plasticizers, c) orienting the material by laminating one sheet to another with the grains at right angles, d) laminating the vinyl sheet to a sheet of inorganic backing material. The combination of resins with plasticizers and stabilizers played an important part in overcoming shrink, but each manufacturer has his own resin preference. Polyvinyl chloride, the copolymer of vinyl chloride and vinylidene chloride, and colloidal blends of polyvinyl chloride with nitrile rubbers are all being used by different flooring makers to produce floorings meeting or beating Bureau of Standards specifications on shrink for hard-surfaced floorings.

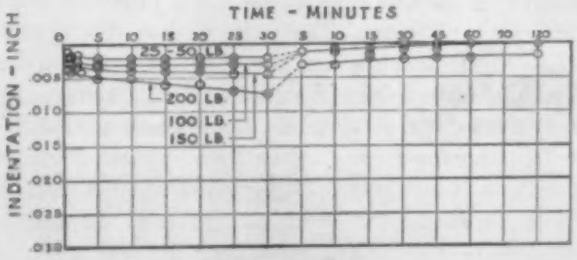
Pigments were a problem, because they had to be selected with care for resistance to light and chemicals. Johns-Manville is using pigments costing as much as $6.00 a pound! The company doesn't have to use much, but inventory looks expensive on paper. All pigments used by all makers are expensive.

Adhesives in some cases were a problem, since vinyl is not porous; but this has been overcome in all cases by sanding the backs of sheet or tile, by

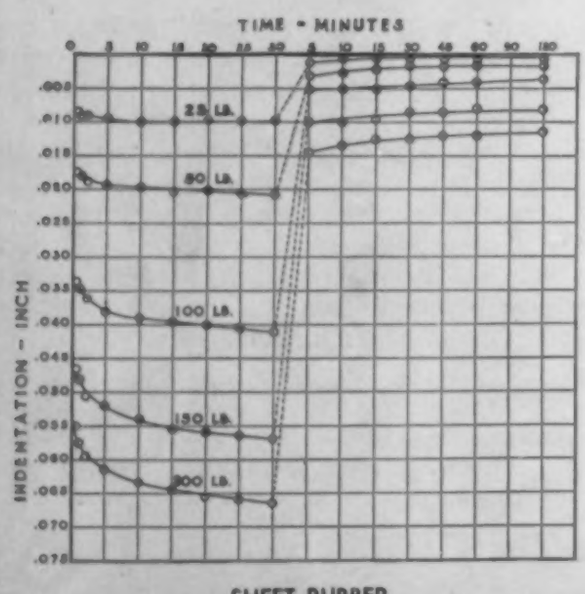
Chart of indentation tests on Sloane-Blabon vinyl tile is shown at left. The other three charts, reproduced through the courtesy of the National Bureau of Standards, show the results of similar tests on sheet rubber, battleship linoleum, and asphalt tile



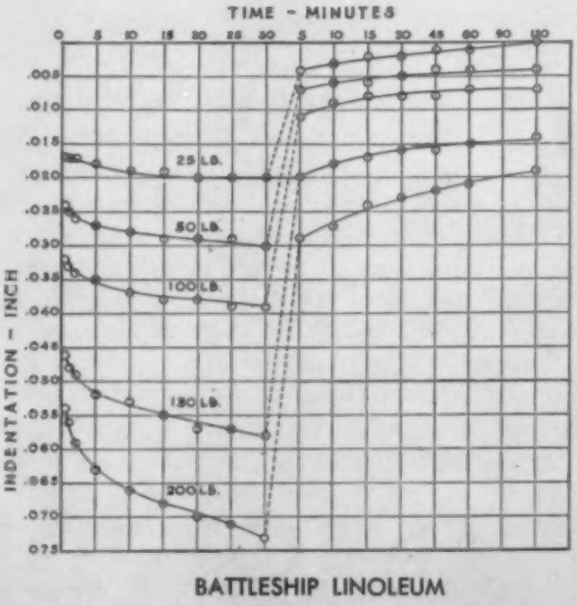
KOROSEAL



ASPHALT TILE



SHEET RUBBER



BATTLESHIP LINOLEUM

adjusting formulas to accommodate standard flooring adhesives, and sometimes by developing special adhesives.

Two floorings with backings of other material are readily applied with the use of regular linoleum cements.

All these vinyl floorings are designed to be laid by workmen trained to handle linoleum and asphalt and rubber tile. They're all easy to cut and easy to bend and set with a quick application of heat fol-

Even roller skates have no effect on the vinyl flooring made in roll form by Delaware Floor Products, Inc.

lowed by pressure with a cold cloth. Indeed, the extruded cove or baseboard material supplied by some of the makers is applied on inside or outside right-angle corners with equal ease. Thus training of contractors' workmen to use a new material, a problem in most fields of construction and application, was eliminated.

Tile and coving

Sloane-Blabon Corp., using B. F. Goodrich Chemical Co.'s polyvinyl chloride resin with mineral filler and a balanced group of plasticizers, produces "Koroseal" tile in two grades, ⅛ in. thick, in sizes of 4 by 4 in., 6 by 6 in., 9 by 9 in., 11⅞ by 11⅞ in., 17⅞ by 17⅞ in. as well as in a 36 by 36-in. slab for feature strip cutting, and two kinds of extruded coving, one to set on top of the tile, one to butt it.

The Sloane-Blabon tile, is made in 18 clear solid colors and 18 blending marbleized designs, with a similar range in feature strips and coving. One of these colors is pure white—the only white on the market. Top price is 66½¢ a sq. ft. to contractor-distributor, with an installed price of $1.00 to $1.25 a sq. ft. depending on location of job, size of floor, and intricacy of design.

This tile is made by compounding on a Banbury mill, calendering, laminating two sheets of calendered material and satin-finish press polishing at

COLOR PLATES ABOVE AND LEFT, COURTESY, BAKELITE CORPORATION

Vinyl floor in kitchens withstand heavy traffic and constant exposure to greases, acids, and moisture

the same time, and later sanding of the bottom to gage. It is made to the dimensional stability set up by the Bureau of Standards for floor tile and is applied with one of two adhesives, one for the tile and the other for the extruded coving, the tile adhesive being a two-coat or sizing job. The tile cements directly to concrete or plywood but requires a saturated felt underlayer when put on a board floor, to discount wrap and cracks.

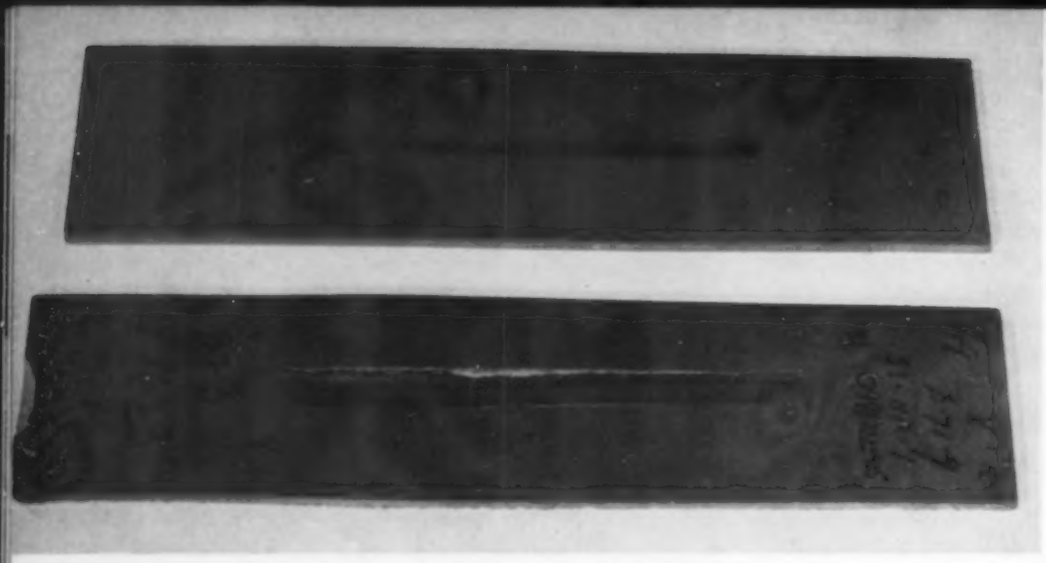
Indentation tests on Sloane-Blabon tile as compared with battleship linoleum, sheet rubber, and asphalt tile, all of approximately the same gage, are shown on the chart on page 78. The resiliency is obviously excellent, and recovery from indentation is both fast and complete. One of the photographs shows results of a caster test on a piece of this flooring compared to 3/16-in. well seasoned linoleum. A Taber abrasive tester with CS-17 wheels showed the following comparative losses for 10,000 revolutions:

Battleship linoleum	1.25 grams
Rubber tile	.75 grams
Asphalt tile	.75 grams
Vinyl tile	.20 grams

Because of the special colors used, Sloane-Blabon Corp. watches relationship of pigments to plasticizers closely, conducting 40 and 80-hr. fadeometer tests continually, insuring light-fastness.

Feature strips

Johns-Manville Corp., using Vinylite resins, produces a ⅛-in. vinyl tile in sizes 9 by 9 in., 12 by 12 in., and 18 by 24 in., with feature strips 24 in. long and in widths from 1 to 3 inches. An extruded cove may be available soon, first in black and later in colors. The tile itself is made on standard asphalt tile manufacturing equipment and meets Federal shrink specifications for asphalt tile. *(Turn to next page)*



Test strips of Sloane-Blabon's vinyl flooring and a high grade of battleship linoleum. The vinyl strip, at top, withstood 66,000 strokes of the testing machine under a very heavy pressure. At this point the test was stopped; the material showed only a faint streak to indicate the terrific punishment to which it had been subjected. The linoleum strip, at bottom, broke down completely after only 18,721 machine strokes

Two features of the Johns-Manville vinyl tile are: three-, four-, and five-color marbleized effects in 16 color ranges, all geared to the Better Home Furnishings color coordination program and color-engineered by Lurelle Guild; and a dull initial finish which develops a soft patina polish as the floor is exposed to wear. Polishing of this tile with emulsion-type wax is recommended.

The Johns-Manville tiles are laid with the company's regular asphalt tile adhesive. They cut easily and form to simple curves with no trouble. Asbestos and other mineral fillers are used with special plasticizer and light-fast, heat-stable pigments.

Scratch and flame resistance

Latest entry in the field is a scar, scratch, and flame resistant material produced by the Chemical Products Div. of Goodyear Tire & Rubber Co. Held in the development and experimental installation stages for about two years, the new material was introduced late in December, and will soon be followed by films, supported and unsupported sheeting, and extruded items.

Produced in a wide range of solid and marbleized patterns, the Goodyear flooring has about the same resiliency or identation recovery as rubber, yet it possesses more than twice the wearing qualities of rubber and the best grades of linoleum.

The material is described as a homogeneous mixture of vinyl resins, plasticizers, pigments, and colors. The vinyl resins are Goodyear's own, now being manufactured at a subsidiary, the Pathfinder Chemical Corp. The resins are produced from acetylene gas and hydrogen chloride by a special catalytic process developed by Goodyear engineers.

Plasticizers are a non-fugitive type, designed to give the best performance for indentation, flexibility, and age resistance. Pigments used were selected for imparting resistance to indentation, resistance to scratching, and for their flexibility characteristics. Colors used, except for carbon black, are inorganic and therefore resistant to light aging. The carbon black is outstanding for permanent jetness.

An unusual feature of Goodyear's production announcement is the disclosure that the flooring is a calendered material, eliminating the use of the conventional "press cure" procedure. This method lends itself to high speed production, and its production secrets are close to Goodyear's chest.

The material is available in three thicknesses, 1/32, 1/16, and 3/32, in roll form, 36¾ in. wide. Tiling and decorative designs are to be custom processed by individual installers. Goodyear is also producing a vinyl cove base of the set-on type, with sharp top and bottom edges to prevent collecting of dust and dirt. It is produced by an extrusion method and can be obtained in lengths up to 50 feet. Being thermoplastic the cove can be easily formed to fit inside and outside corners.

Rugged characteristics

Goodyear's product has had tough tests. The rugged characteristics, it is claimed, make it possible to use lighter gages of vinyl, 1/32 or 1/16, where heavier gages of linoleum or rubber are required. This, as an important factor on the economy side of the flooring picture, is part of Goodyear's bid for business.

The charts on page 81 show results of accelerated laboratory tests. In addition, this material has been exposed for months to Florida sunshine with no change in appearance or hardness and has been tested in all gages on promenade decks of steamships, in railroad cars, offices, and industrial buildings, as well as in kitchens as flooring and drainboard coverings.

Spot tests with a large variety of commonly used foods, beverages, medicines, cosmetics, cleaning agents, and chemicals show no permanent staining. Cleaning is accomplished with any of the conventional detergents or abrasive cleansers. The material remains unaffected by animal, vegetable, or mineral oils and greases even at elevated temperatures; should it become soiled with oil or grease, it can be

cleaned easily with gasoline. Only light coats of emulsion, liquid, or paste waxes are recommended.

Smoldering cigarettes are claimed to be no problem to the material. While they may soften the surface, embedding ashes, such stains can quickly be removed with steel wool and soap. The flooring will not burn where there is no supporting blaze. Goodyear may make it completely fireproof when certain materials become available.

Installation of the Goodyear vinyl flooring is essentially the same as with any other type of resilient floor covering except that it is more thermoplastic. Both flooring and cove are brought to room temperature before unrolling and then laid out flat.

The flooring can be formed to fit contoured surfaces by heating the material on the job and forming it to fit the contours while warm. It may easily be cut into tile if the material is heated before it is cut, the heat being applied only to a small area surrounding the path of the knife. The company has developed a special device with two electrically heated platens to aid the tile cutter, and a similar device to heat the edges of a lapped seam which is to be double cut. The heaters come in two sizes, 29 in. and 49 in. long.

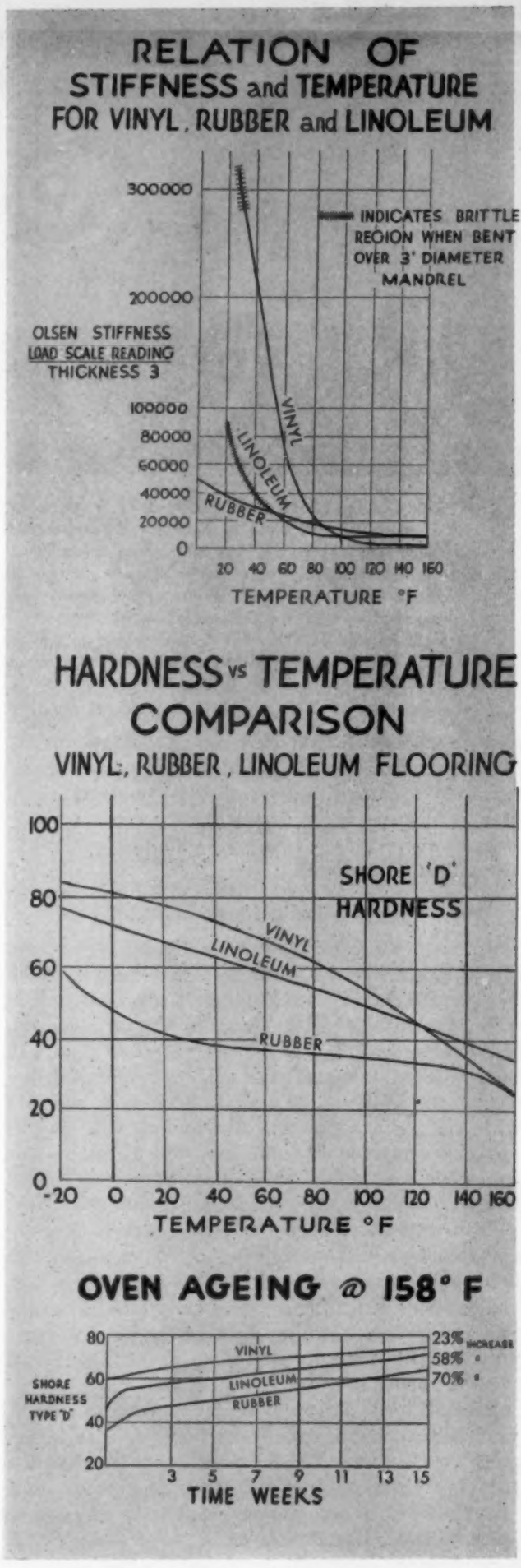
Underlayment is used with this flooring as with linoleum. It is important that the floor underneath be clean, crack-free, and smooth. Concrete should be treated with muriatic acid, rinsed, and dried. Finally, application on concrete floors in direct contact with the earth is not recommended, due to adhesion problems which are caused by osmetic and hydrostatic pressures.

Roll flooring

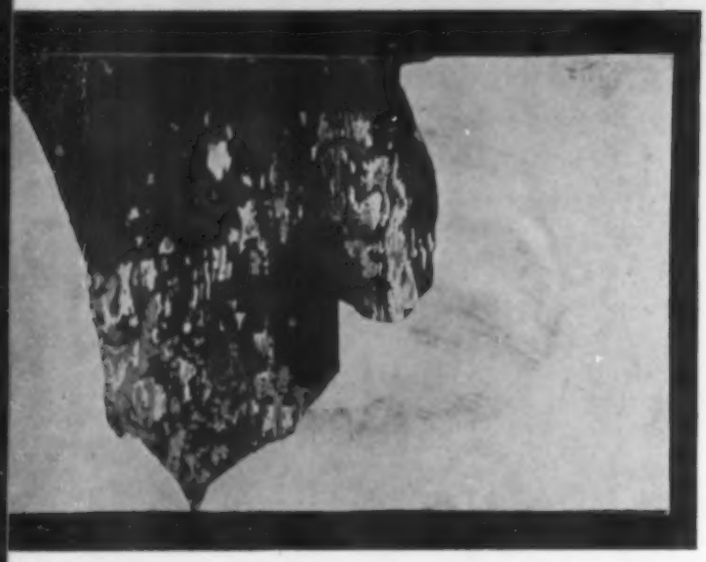
Delaware Floor Products Inc. produces an entirely different material. Sold in roll form, 72 in. wide, it comes in six lightly marbleized colors, and is laid in the same manner as ordinary linoleum and with linoleum cement, except that it lays more readily because of its flexibility. This is the mass-market material, designed and priced for the average consumer, although adaptable to industrial use also.

This product, "Flor-Ever," is made from Vinylite resin, compounded with asbestos and other inorganic fillers, sheeted on specially designed new machinery and laminated by roll to a specially saturated felt back. It is fire-resistant, is claimed to stand 360° F. heat with no damage, and is not permanently marred by lighted cigarettes. Its resistance to acids, alkalis, abrasion, grease, shrink, and indentation are attested by reports from independent testing laboratories.

Thomas Moulding Floor Manufacturing Co., using a special high molecular weight Vinylite resin plus an inert binder, chemically-resistant fillers, and special plasticizers, make a tile called "Chemproof" which has a heavy filler content and special resist-



Right: Results of a series of accelerated laboratory tests on vinyl, rubber, and linoleum flooring. Curves reproduced by courtesy of Goodyear Tire and Rubber Co.



Ability of Goodyear's vinyl flooring, 1/16 in. thick, to withstand excessive abuse is shown in this unretouched photograph. The flooring was mounted on plywood and then tested in a device which simulated the action of casters on a swivel chair. Weight of 240 pounds was applied while the machine made 30,000 cycles over an 80-hour period. The vinyl material showed no sign of breakdown; the underlying plywood was severely damaged

ance to chemicals and abrasion. Available in six solid standard colors, in a flat finish, it is designed especially for tough industrial and commercial use, such as in stores and food plants. The company provides its own adhesives for laying the tile: otherwise installation is standard.

Satin finish

Pantasote Corp. of New Jersey produces a vinyl tile ⅛ in. thick, satin finish, in sizes 6 by 6 in., 9 by 9 in., and 12 by 12 in., with 18-in. feature strip. Roll material will be available later in the year. Resins, plasticizers, and fillers used are secret to date, but the company states that the process is one of calendering and pressing. A special adhesive is supplied with the tile to wholesale distributors who buy at approximately 40¢ a square foot. The Pantasote tile comes in five solid colors and seven marbleized shades. Emulsion waxing is recommended.

Industrial Synthetics Inc., well known as vinyl compounders and extruders, are moving into this field with a press-oriented tile, the resins for which are compounded in their plant. Only other information available at the time this article went to press was that the company is coming up with a special merchandising program.

Presto Plastic Products Inc. is marketing a ⅛-in. thick press-polished solid sheet, 9 by 9 in. size, in five marbleized colors. Geon resins of the copolymer polyvinyl chloride-vinylidene chloride type are used. "Presto-Tile," as the material is called, competes in price with good grade linoleum.

Surprenant Electrical Insulation Co. has ready for market a high-gloss tile made with Vinylite resin and a special group of heat-resistant fillers with dioctyl phthalate plasticizer. Surprenant has for years engaged in research in overcoming shrink in vinyls and is using knowledge thus gained in making the tile. It is applied with adhesives specified by the maker but handles and cuts like linoleum.

Others in the field and now offering vinyl flooring for sale are Special Formula Chemical Co., Plastic Flooring Co., and Fremont Rubber Co. The Casto Manufacturing Co., which was working on vinyl flooring, is closed down temporarily in receivership.

More to come

All the big linoleum makers state that their vinyl flooring research is continuing, and announcements may be expected from some of them in a few months.

So much for the present—which appears big enough in production and market scope to use all the vinyl that will be available for flooring this year. As for the future: one research man has pointed out that a clear vinyl sheet, printed and then laminated with cross-grain orientation to another sheet, the printing in the middle of the sandwich, would be quite as effective as inlaid linoleum and probably much less costly. That's just one idea; scores of others are under study. "Operation Underfoot" looks like the biggest development in vinyl resins since V-J Day!

Acknowledgments

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David Carson, "Retailing Home Furnishings."

Martin E. Weiss, Delaware Floor Products Inc.

Prestige

+ SALES-MAKING ATTENTION Will Accrue to Entries in

The Seventh

MODERN PLASTICS COMPETITION

FROM manufacturers using plastics components, from industries using plastics in processing, from plastics material suppliers, from molders, laminators, fabricators, and processors of plastics the entries are coming in to the Seventh Modern Plastics Competition.

There is a four-fold reason behind their prompt participation in this great event.

First, there is the opportunity to win an award in one of the 20 classifications—the winners to be selected by a completely independent Board of six judges chosen from the fields of industry, industrial design, and merchandising.

Second, due to the interest of executives and buyers who will visit the Exhibit of Entries in New York City in September, there is opportunity for expanded sales for all companies entering in the Competition.

Third, widespread additional business-building interest will follow the traveling exhibits of award-winning items which will tour the United States and other countries following the Competition.

Fourth, the general public relations value of the Competition to the industry, based on the tremendous publicity surrounding the event, will do much to help all future merchandising of plastics.

Since every entry will be indexed with full credit to all parties who have contributed to the production, recognition for all contributory efforts will be complete. This will react to the advantage of the designers, molders, machine builders, tool engineers, and material suppliers concerned, as well as to the manufacturers of the item entered. A Brochure of Entries will reach all important executives in all industries who are interested in plastics.

This is your opportunity to register your product or your participation in a product in the list of great and good things produced from plastics since V-J Day!

The Competition closes midnight, May 15, 1948. Write now for as many entry blanks as you require. There is no entry fee!

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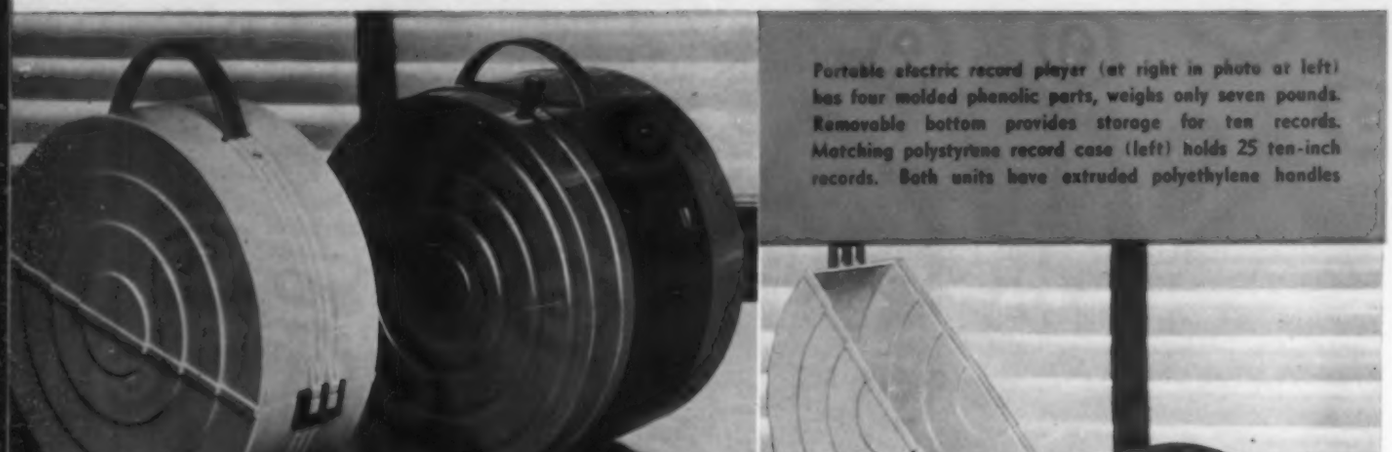


Portable electric record player (at right in photo at left) has four molded phenolic parts, weighs only seven pounds. Removable bottom provides storage for ten records. Matching polystyrene record case (left) holds 25 ten-inch records. Both units have extruded polyethylene handles

Top section of record player has steel insert molded in center so that it can also serve as the turntable. Carrying case has molded in legs on outside and slots on inside to keep records from hitting against each other. Latch is also of polystyrene

Record Player Steps Out in Plastic

Unique design of portable player, molded in phenolic, matches polystyrene record carrier

TWO companion plastic items whose smart appearance and attractive colors should be "right in the groove" with the younger set—a portable electric record player and a carrying case holding 25 ten-inch records—have recently been placed on the market by Hamilton Associated Industries, Inc., Chicago, Ill. While the merchandising appeal of these new products is obvious, they are also noteworthy from the standpoints of functional design, selection of material, and the several molding problems involved in their production.

The Carousel record player, weighing only 7 lb. complete, is molded of general purpose phenolic material and is so designed that the lid section, when removed and placed upon the record spindle, functions as the turntable. The complete unit houses all the mechanical and electrical parts and also has storage space for 10 records in the removable bottom.

Harmonizing closely with the record player in design, the Cara-Tune record carrying case consists of two halves injection molded of polystyrene Both units have carrying handles of extruded polyethylene—a fairly unfamiliar application for this material.

Light and compact

Many months were required to perfect the design of the Carousel and complete the tooling program. One of the principal problems faced by W. D. Caddell, the designer, was to produce a unit which would be as light and compact as possible without compromising its record playing performance. In addition, it was necessary to provide adequate space for record storage, to insure a firm supporting structure for the mechanical and electrical parts, and to make certain that the molded parts would hold fabricating and assembly operations to a minimum.

A thermosetting material was specified for this unit as a safeguard against possible dimensional changes due to the weight of the motor, tone arm, and other functional parts of the device, and the heat generated by the two-tube amplifier. The four phenolic parts for the Carousel are being run in Indur general purpose material produced by Reilly Tar & Chemical Co., Indianapolis, Ind. Solar Plastics Co., Chicago, Ill., molds the parts in red, walnut grain, and tan, and the finished Carousel is offered in six combinations of these colors.

When assembled for carrying, the instrument resembles a hat box in appearance, measuring 10⅜ in. in diameter and 6⅝ in. deep. The end pieces of the unit, which are actually the top and bottom when it is laid down flat, are almost identical in size and design. A series of concentric ribs minimize the possibility of warpage and also break up what might otherwise have been a flat, uninteresting appearance.

Centering stud molded in

The bottom, which forms a removable compartment for records, is molded with a centered ¼-in. stud as an insert, to serve as a centering device for the records. It is molded with a lip which slips over a mating ledge on the body section when the latter is placed over it. Records are cushioned against breakage by a sponge rubber pad on the stud.

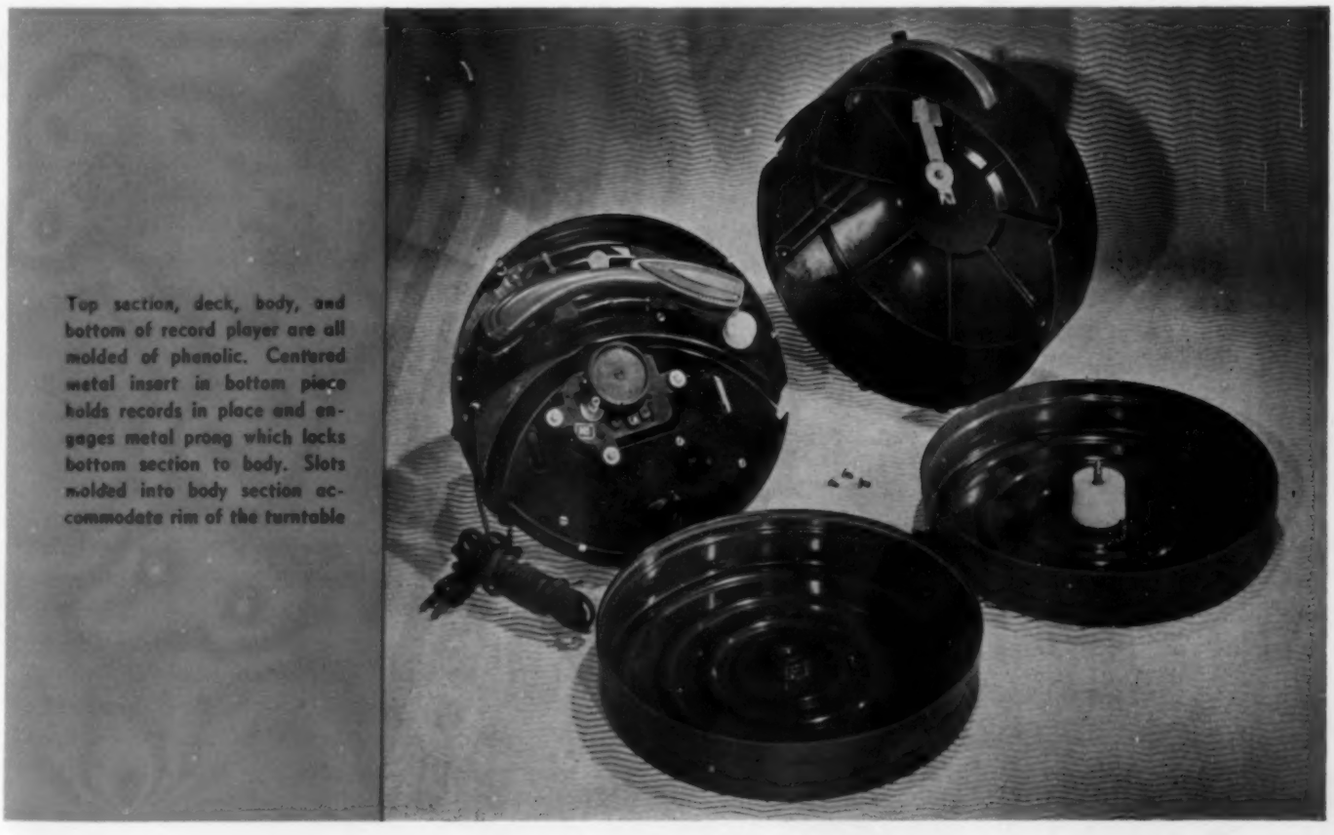
Passing up through a cored opening in the body section when it is placed on the record storage compartment, the stud, which is grooved near the top, is engaged by a sliding metal prong which firmly locks the two parts together until the prong is retracted by pulling a knob located on the outside of the body section. An accompanying photograph clearly illustrates how this locking device works. An internal spring holds the clip firmly engaged in the groove until the knob is pulled. With this arrangement, the record storage section and body are quickly locked together.

The top section, which also functions as the turntable, has a circular steel insert molded in the center which is slipped over the spindle to place the turntable in operating position. The insert does not show on the outside surface of the piece, since its lower section is concealed by a 1/16-in. layer of molding material. On the inner side of the turntable, the insert is anchored in a boss 1⅛ in. in diameter.

Accuracy imperative

Extremely accurate alignment of the insert is imperative to insure that the turntable does not wobble in operation. The straight hole in the insert is reamed to a taper after the molding operation so that it will seat properly on the tapering spindle shaft, which projects through the hole in the turntable to hold the record in place while playing. Another fabricating operation on the lid component involves milling a groove around the inner circumference of the sidewall, near the lip. This groove engages three elbow clips which cause the lid to snap firmly in place.

(*Please turn to next page*)



Top section, deck, body, and bottom of record player are all molded of phenolic. Centered metal insert in bottom piece holds records in place and engages metal prong which locks bottom section to body. Slots molded into body section accommodate rim of the turntable

Largest of the four phenolic pieces in the Carousel is the body section. This is, in effect, a flat "can-like" part whose bottom, reinforced by six radial ribs, forms the top of the record storage compartment. Two large molded-in slots in the periphery of this piece accommodate the rim of the turntable when it is in playing position, substantially lowering the height of the entire assembly. The body section is strengthened at three points by heavy vertical ribs containing tapped brass inserts at the top, by means of which the fourth part—the deck—is fastened in place with small bolts.

Two narrow slots molded in the sidewall of the body section receive the polyethylene carrying strap, which is folded over inside and riveted at one end and secured at the other by a nut and bolt passing through a double thickness of the extruded section. The shank for the locking plunger projects through a small opening drilled in the side of the body section. Two exterior ribs serve as feet for the Carousel when it is stood on edge.

Last of the molded parts is the deck, which includes the integral speaker grille and supports all the functional parts of the instrument. The deck itself is a slip fit to the body and is held in place by three bolts, as mentioned above. Mounted on the deck or suspended beneath it are the tone arm, motor assembly, amplifier, and on-off switch which also serves as a volume control knob.

The deck is ribbed on the underside for additional rigidity and contains a deep annular groove on the upper surface into which the rim of the turntable fits. The motor assembly, with conventional rim drive, is cushioned by rubber pads and fastened to the deck by means of three bolts which engage threaded bosses. The tone arm is anchored through an opening cored in the deck, while the speaker diaphragm is suspended beneath it, fitting up closely into a molded rim which prevents sound from "leaking out" below deck. The turn table spindle bushing is molded into the deck as an insert. This insert must be critically held to an angle of 90° with the deck, so the turntable will revolve in a horizontal position.

The three elbow clips engaging the groove in the rim of the lid are barbed at the lower end and driven into cored bosses around the inside surface of the deck lip, where they remain firmly fixed. Large openings cored in the deck, other than the decorative grille, include that through which the motor assembly is inserted and two ventilation slots. Another boss, projecting from the deck surface, serves as anchorage for a spring clip which secures the free end of the tone arm against swinging around when the Carousel is being carried.

Preforms used in molding

There are three dies for the phenolic parts of the Carousel—one each for the body and deck sections and a two-cavity die which makes a top and bottom lid simultaneously. Preforms are used in molding all four pieces and at present experiments are under way with electronic preheating and oven preheating to determine which is more satisfactory for this job.

One of the toughest technical problems involved in molding the Carousel parts stemmed from the high dimensional accuracy required in the finished parts. This was complicated by the fact that the three different colors of molding powder ordinarily used had different shrinkage factors, making it extremely difficult to match up color combinations without resorting to the "fit and try" method.

This difficulty was overcome by means of two steps: First, the material manufacturer formulated a special batch of general purpose phenolic material in which the shrinkage factor for all three colors coincided. Second, the molder supplemented this approach by employing steel shrink fixtures for all four parts. These fixtures were designed to make allowance for differential shrinkage in the molded parts due to direction of die movement and related factors. The turntable, in particular, must be concentric and flat to insure satisfactory performance.

Polystyrene record case

The Cara-Tune record carrying case, sold either separately or as a companion unit for the Carousel, is injection molded in two halves by Anfinsen Plastic Molding Co., Aurora, Ill. This unit is produced in six colors of Lustron molding material, with contrasting latch and strap. Selection of extruded polyethylene rather than a vinyl material for the carrying strap was based on the fact that the former contains no plasticizer and cannot craze the polystyrene case. This handle, for which the section is extruded by Anesite Co., Chicago, Ill., is inserted through two molded-in slots in the upper half of the unit and the ends are riveted directly to the wall of the case.

The concentric ring design of the Cara-Tune effectively conceals the draft of the pieces and also harmonizes with that of the Carousel. Three lugs, molded integrally with the lower section, provide a firm base on which the unit rests. To facilitate record removal and loading, the case is so designed that the division line between the two halves slants downward toward the front. The upper section closes down over the lower part and comes to rest against an inner ledge concealed by a decorative rib along the edge of the top piece.

Slots molded into the lower half of the case support 25 records so they do not strike together when the case is carried. An interlocking continuous hinge, molded integrally with the halves and filleted for strength and improved appearance, holds the two parts firmly together. The hinges are drilled and metal hinge pins inserted. The latch, in contrasting colors, is also of polystyrene. Hinged to the upper half of the case, it engages two projections on the lower section.

Labeling Plastic Products

PRINTED paper labels for colorful identification or decoration can be applied to plastics quickly and economically with a machine called the Label-dri, specially developed by the New Jersey Machine Corp., Hoboken, N. J., for labeling plastics. It applies thermoplastically coated labels, thus eliminating fluid adhesives.

Polystyrene replaces wood

The new machine made it possible for the Noma Electric Co., New York, N. Y., to improve one of its products by changing from wood to polystyrene. The product was a toy, the Acrobatic Clown, designed to interlock so that children could build a variety of formations simulating the antics of acrobatic clowns. One of the many possible formations is shown at the bottom of this page. The nature of the toy made it essential that it be decorated to look like colorful clowns.

Noma decided to use polystyrene instead of wood to make the toy lighter, to eliminate the hazard of splinters, and to add color to the entire product. By keeping the same dimensions, Noma planned to make use of the same labels, thus making use of its investment in color plates and die-cutting. This would also make the new product similar in appearance to the well-accepted wooden toy.

The problem was to find a practical method of applying the labels in mass production. This was complicated by the fact that the label had to be placed in a recessed area formed by outside edges which projected 5/16 in. beyond the thin body section of the polystyrene clown.

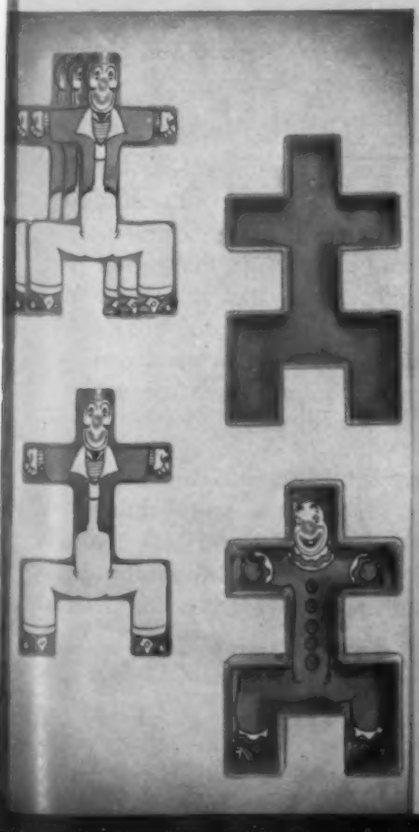
Furthermore, the fluid adhesives available for bonding paper to plastic contained either resin or latex. The accelerated evaporation of rotating glue rolls on labeling machines caused these adhesives to become unworkable as the solvents "gave off."

Label coated with plastic

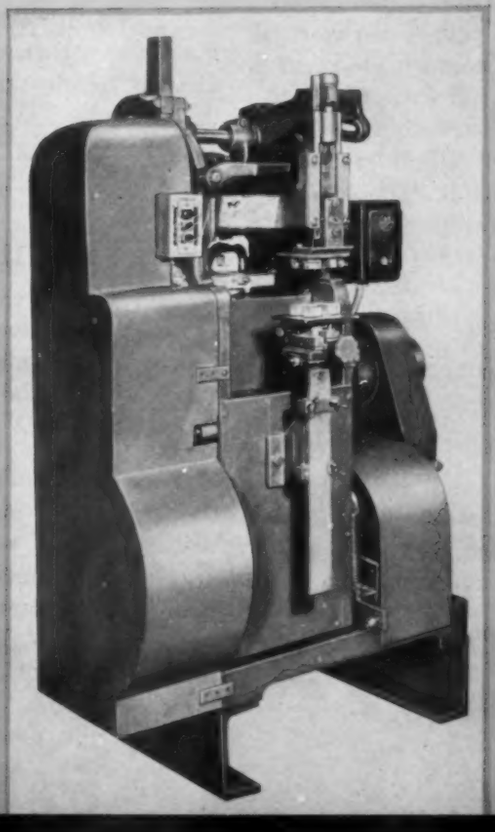
Noma found the solution in the Label-dri. In this machine, a heating unit activates the thermoplastic coating on the labels to the proper tackiness necessary for adhesion. The machine is also mechanically capable of applying labels into recesses, a feature which had been incorporated in the machine because recessed labels are often used on bottles and jars. Although similar machines have been used for labeling glass and metal, Noma is the first to use the process to label plastics.

The plastic coated label used in the Label-dri was developed by the Nashua Gummed and Coated Paper Co., Nashua, N. H. It is claimed that the labels anchor without loose edges or blisters.

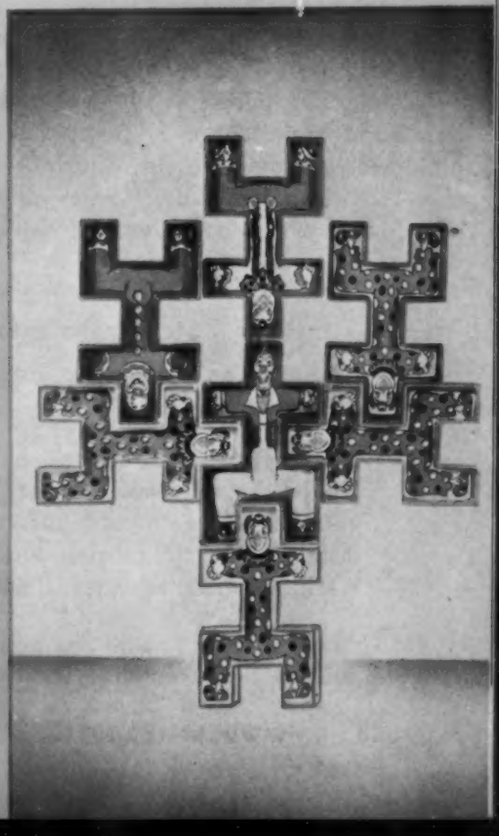
Paper labels attached to recessed surface decorate molded polystyrene clowns



New machine automatically heats coated labels to proper tackiness for adhesion, and applies them



Labeled plastic toys look like clowns, can be used to build various acrobatic formations



Durability of Urea-Formaldehyde Adhesives

An evaluation of the results obtained by users of these adhesives, after some 10 years of practical experience

by THOMAS D. PERRY

ANY quality such as the durability of a urea resin adhesive is necessarily relative. Its measure depends on the background against which the product is judged, and that background is not fixed, but tends to change from year to year. There is no ideal or all-purpose glue or adhesive from which desirable standards can be derived. Neither is there any test procedure by which glue bonds can be rated, as 70, or 80, or 90% water resistant for example. Too many variables are involved, and such hoped-for evaluation standards remain for the future to develop.

Experience is the practical test

Hence the only practical method at present of determining quality is to compare the results of using these urea adhesives with the prior art, which is still widely practiced in the types of wood products that are discussed here.

These wood products can be defined as household furniture, home and office equipment, interior trim, plywood, radios, pianos, and other similar items that are normally in protected locations and at temperatures and humidities under which people can work and live in reasonable comfort. Since such products may occasionally have semi-protected exposure for limited periods, as on porches or in partially enclosed summer houses, the durability of adhesives used should be adequate for any reasonable exposure in factory, warehouse, exhibit room, transportation, and normal use.

Stating the question

With this as a basis for discussion, the question to be answered becomes:

> Are urea resin adhesives, as now widely employed for plywood production and assembly gluing in the products defined above, of adequate durability for the purpose intended, and do they mark a definite advance in adhesive technique?

This question might be put in still another form as follows:

> Do manufacturers of these products, in which urea resin adhesives are employed, find that their customers, over the years, recognize a distinct quality improvement over similar products made before urea adhesives were available? Is the ratio of damage claims higher or lower?

Evaluations for military requirements

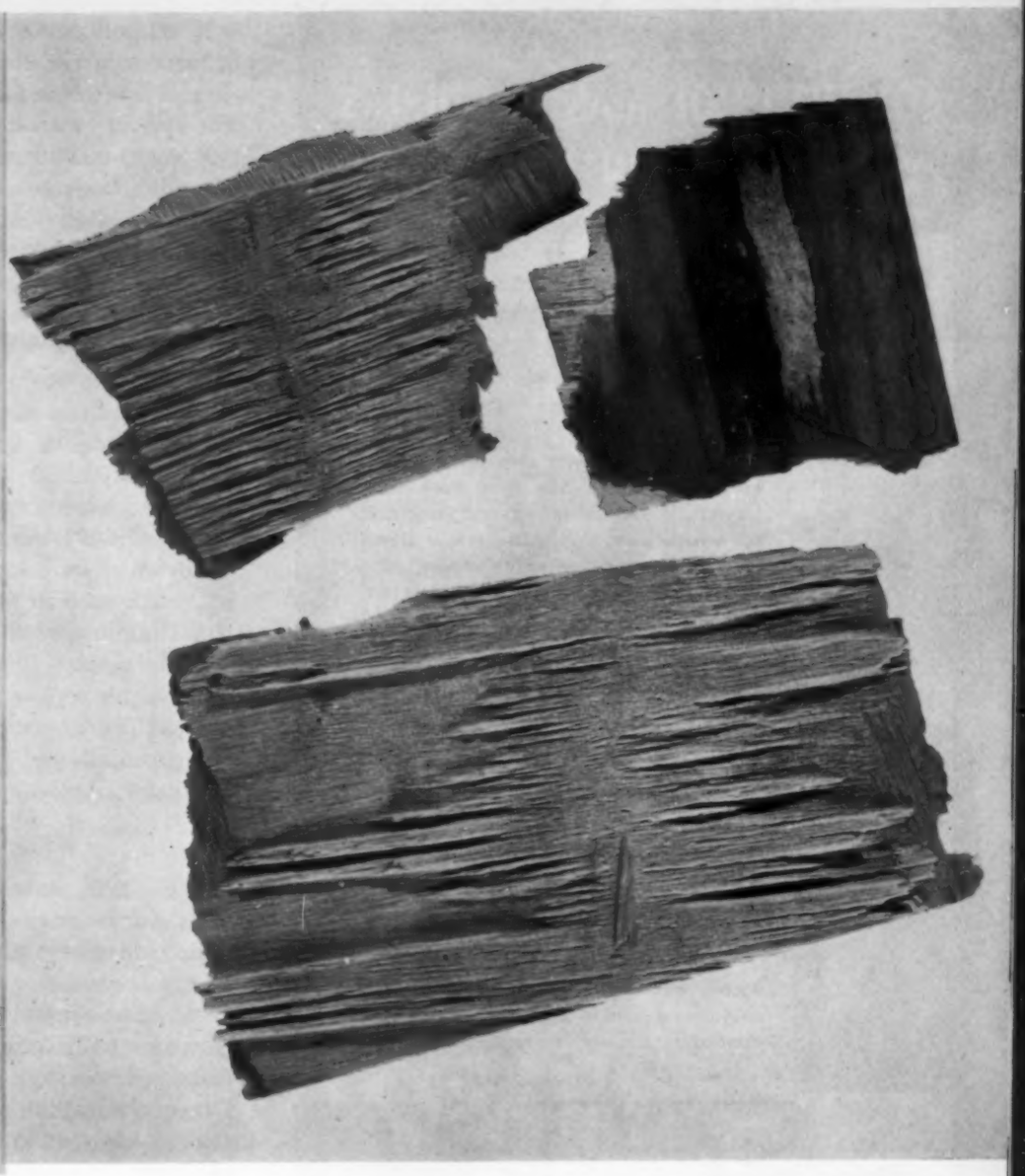
The author is not concerned, for the purpose of this discussion, with the many reams of technical reports, largely related to military procurement, in which ureas have been approved or limited. Most of these specifications, and their rigid tests, were based on man-made and accelerated exposures of maximum severity and the tests were conducted on a critically analytical basis. The tests served their purpose well in controlling the quality of the essential implements of warfare, in spite of their costly and time consuming features. The urea resin adhesives met many of these requirements with entire satisfaction. Except in a general way, these technical evaluations have little bearing on the use of adhesives in our everyday lives.

It is worth noting, however, that the Army Air Forces, in a post-war review[1] of "Wood and glues in aircraft" made the following statement:

> "No cases are known to this Laboratory where urea resin joints, originally well made, failed in service because of elevated temperatures, and the superiority of urea resin joints over casein joints was demonstrated when an inspection of several hundred glider parts, that had been in storage for several months, disclosed that the urea resin joints were generally in good condition, while the casein joints were generally deteriorated."

It is a matter of paramount concern, however, that urea adhesives meet the current specifications, of which CS-35-47 (revised as of February 20, 1947) is an example. This is typical of the transition from many complicated military directives to present

[1] "A review of the problems of specification, inspection and procurement." Army Air Forces Technical Report 5844 on "Wood and glues in aircraft." January 31, 1947, by Don Brouse, Lt. Col., Air Corps, page 32, by permission.



An interesting and significant story, which graphically points up the accompanying article, is shown by these ragged scraps of plywood. These scraps have been tumbled around for years in drawers of desks used by the writer of the article. They are torn and splintered and have never been given the least bit of protection. They have been moved from west to east, from home to office, and from office to office, neglected and periodically forgotten. These plywood scraps are from a radio cabinet glued with a pioneer urea resin adhesive in the spring of 1936 and were carefully marked and dated. The hot press on which they were made was designed years previously for use with blood albumin gluing. The original test to which they were subjected was crude — the writer's heel, reinforced by 225 pounds of human flesh and bone, against a brick wall. The significance of these scraps is that the urea glue joints originally showed 100% wood failure and still do after almost 12 years, demonstrating urea resin adhesives do not deteriorate with age

peace-time requirements. This specification provides, for the products under consideration here, a 4-hr., two-cycle soaking and drying test without appreciable loss of strength. It is entirely practical for properly prepared urea adhesives to meet this requirement with a margin of safety, and within a cost range reasonably comparable to those of other available glues.

Consumer acceptance

One important factor which demands careful exploration in evaluating the durability of urea-formaldehyde adhesives is to determine from practical experience the extent in which the quality of urea glued furniture is better or worse than corresponding products made before about 1936. The verdict should come from the average consumer, all over this country, whose ultimate approval or disapproval directs his supplier in matters of quality and costs. Unless the manufacturer is responsive to these opinions, his enterprise will fail. As a consequence every manufacturer investigates all such complaints with great care. Inefficient processes and unsatisfactory materials are promptly corrected, since a reputation for quality products and prompt adjustment of complaints is essential.

Such an appraisal of customer acceptance obviously cannot be technical in character, but will be broadly representative of regular commercial production, without detailed data as to gluing procedure. Standard urea resin adhesives of the earlier types have been used, and probably most glue bonds were cured under heat. These urea resin adhesives should exhibit their customary excellent resistance both to moisture and fungus growths, and thus be typical of the improved modern gluing processes that are rapidly outmoding the older methods.

(*Please turn to the next page*)

COMMENTS OF MANUFACTURERS ON UREA RESIN ADHESIVES

"We have found urea resin up to grade and expectations in every respect, and it has fulfilled all that is expected of it."

"Our experience with urea resins in plywood for furniture has been much more satisfactory than when we used vegetable and casein glues. . . . After ten or eleven years operating this plant with these glues, we feel safer when we ship our product out, from the standpoint of glue deterioration."

"During the eight or nine years we have been using urea resin adhesives . . . we have received no complaint whatever that the bond did not stand up."

"Urea resin is, in our opinion, very satisfactory and our experience would indicate that once a bond is properly made, the same remains satisfactory in every practical way."

"We have found this glue (urea) the most satisfactory bonding agent we have ever used in our plant in the entire history of our business. There has been nothing quite like it."

"We are reasonably certain that the products of our plant have met the sales specifications, as any large scale failure of our product would have, long ago, brought about a change of materials."

"If you eliminate severe conditions of exposure, then so far as we know, there has been no evidence of glue joints delaminating when used under normal conditions in a home, where such failure could be traced to the fact that the adhesive used was urea resin."

It is well known that urea-formaldehyde resin adhesives derive their moderate costs from the addition of low priced extenders, such as wheat flour. The opinions mentioned below undoubtedly apply to customary mixtures, in which the weight of the flour extender does not exceed that of the urea resins solids. It is obvious that mixes with substantially higher ratios of extenders will be progressively less durable.

Opinions of the industry

In order to get a reliable cross section of experience with urea resin adhesives, opinions were requested from a representative group of leading manufacturers of plywood and furniture, who were known to have consistently used urea adhesives for more than 10 years. No manufacturers of Douglas fir plywood were included, since these adhesives are not much used in this branch of the plywood industry. The number of replies received was phenomenally high, some 70% of the queries mailed out. No unfavorable replies were received. The brief excerpts printed elsewhere in this article are typical. The evidence gathered from this survey is clear, concise, and indisputable.

Other types of evidence

There is other testimony of an equally convincing type. For example, a radio manufacturer can never anticipate where his product will eventually land—in Arctic wastes or Amazon jungles, in dry mountain areas or on remote Pacific islands. Up to about 1936, conventionally glued radio cabinets did not give satisfactory service under severe climatic conditions. One of the leading radio makers, alert to remedy this shortcoming, adopted resin adhesives for all radio cabinets. This policy has been continued. All principal radio manufacturers have since followed suit and use urea adhesives in all grades of their cabinets. This is substantial corroboration of the durability of urea resin adhesives on a world-wide scale.

The installation of hot presses is a measure of the growing use of resin adhesives. It is a conservative assumption that urea resins are used in over 85% of the civilian hardwood plywood made on hot presses. The number of hot presses has constantly increased, except during the war years when they were unobtainable, with larger additions each successive year. Some 300 are now in use in the United States and Canada. There are no known cases where the commercial use of a hot press has been abandoned.

Supply and demand

The demand for urea-formaldehyde resin adhesives has grown so rapidly that a dozen or more of the larger chemical manufacturer are aggressively promoting their manufacture, sale, and use.

The consumption of these resin adhesives in 1947

was unprecedented, and supplies were wholly inadequate. The sources of raw urea and formaldehyde were severely strained during and since the war, but greatly enlarged facilities are expected to come into production some time in 1948, which should help alleviate the situation. Such growth and demand is certainly evidence of satisfactory performance.

The author has been intimately associated with the plywood and furniture industry since 1911. During these years many new adhesives have appeared, and customers have become more and more "durability-conscious". It is his considered opinion that urea resin adhesives, as commercially used today, represent the most durable wood adhesive that can be obtained on a cost basis reasonably equivalent to those of the earlier conventional glues. There is no doubt, however, that important improvements are yet ahead in this field.

Other resin adhesives

No mention has been made, so far, of the resin adhesives based on phenol, melamine, and resorcinol. There is no doubt that their durability, under severe exposure, surpasses that of the urea types, but their present costs and technical requirements place them in a different range and bar them from most standard grades of furniture.

Their use is strongly recommended for furniture, mechanical equipment, and structural members exposed to the weather. It is equally important that they be used in products which are especially designed for marine service, for dye houses, tanneries, textile mills, and for tropical climates. Under such conditions no competent authority would normally advocate the use of urea resin adhesives. This is in spite of the fact that radio manufacturers found that urea resins substantially reduced their unknown exposure hazard over the earlier conventional glues.

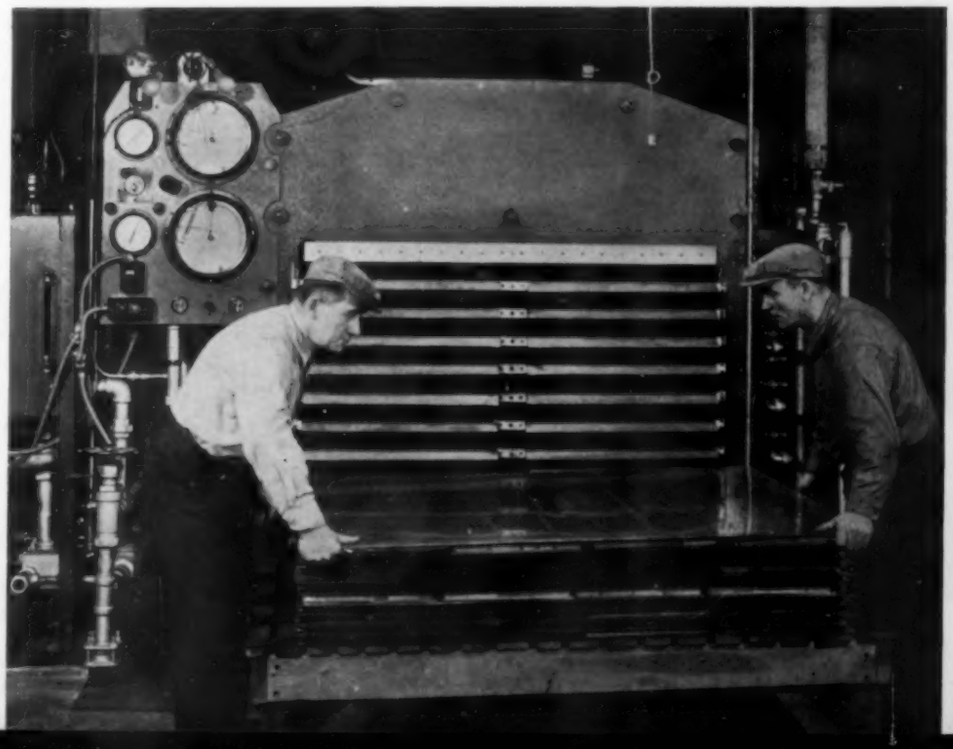
Some comment is in order regarding the relative durability of hot pressed urea adhesives when contrasted with the durability obtained from curing at room temperatures or at moderately elevated temperatures. For some time many authorities have claimed that hot pressed bonds were more durable than bonds cured at room temperature. The most recent studies have detected very little difference. Practical experience has shown, however, that heavier spreads are required in room temperature work, and that permissible extender ranges are slightly lower. The net effect is a saving of approximately one dollar per 1000 sq. ft. of glue line cost for hot pressed bonds in comparison with cold bonds of equal durability. Besides this cost saving in adhesive material, the use of hot presses shortens the process time and lessens the required floor space.

Conclusions

Enough evidence has been presented to make it indisputably clear that for normal exposures, such as outlined, urea-formaldehyde resin adhesives are entirely adequate for the service intended, and that they are clearly a technical improvement in the gluing art. It is further evident that customer complaints on durability have been negligible during the 10-yr. period under review. It has also been shown that enterprising manufacturers of plywood and furniture are striving in every way to procure urea resin adhesives and to make them their standard of quality.

It still remains an obligation on the manufacturer to buy high quality urea adhesives and to use them intelligently. Only in this way can he be assured of consistent and maximum durability in his finished product.

PHOTO COURTESY PLYCOR CO.



Plywood for use in the manufacture of furniture is shown here as it is being hot pressed with ureaformaldehyde resin adhesives

Wind-up motor propels car across table but an ingenious mechanical device prevents the car from running off the edge of the table. When it reaches the edge, car automatically turns and starts off in another direction. Car is molded of colorful cellulose acetate butyrate and transparent polystyrene. Bottom, motor, and winding key are made of metal

New Thrills With a Toy Car

Plastic permits the manufacturer to carry out design details with distinctiveness and authenticity

A TOY automobile that makes children grin with delight and grown-ups gasp with astonishment is now being marketed under the name "Timely Turnabout." When its spring motor is wound up with a key it meanders merrily across a desk or table top but refuses to take the jump over the precipice when it reaches the edge; it simply turns around and starts meandering merrily in another direction.

This 6-in. long streamlined toy car is manufactured by Timely Toys, Inc., St. Louis, Mo., having been designed and engineered by Edw. C. and Wm. E. Hoffmann of Triple "E" Products Co. Molded parts are furnished by Santay Corp. of Chicago, Ill. The body is molded of Tenite II cellulose acetate butyrate and the dome of polystyrene or Tenite II.

The device which makes the toy turn at the edge of a table top is the fifth wheel which is set into the frame at a right angle to the other wheels. When the car is running on a level surface, this wheel is turning but does not touch the table. When one or both of the idling front wheels of the car project beyond the table top, the body dips slightly, due to the pivoted front axle, bringing the fifth wheel into contact with the table, thus causing the car to turn and head in another direction.

The manufacturer states that plastic was employed as the ideal material for this toy because it was the best medium with which to carry out the design lines with distinctiveness and authenticity. Bright colors give the toy a smart, modern appearance. Furthermore, with plastics the trademark may be "hot stamped" into the finished body, thus allowing body molds to be used in other models with other names. Butyrate was selected for the body because the toy car must be virtually shockproof to withstand "enthusiastic" handling by smaller children. Further advantages of plastics, according to the manufac-

turer, are the low number of handling and finishing operations necessary; lightness of weight which results in lowered transportation costs; and the elimination of sharp edges due to the smooth character of plastic.

The body of the toy car is run in a 9-oz. injection press, using a four-cavity mold. The pieces are gated on the side, toward the back, about on a line with the rear wheels. There is an ample wall section, insuring ability to take plenty of abuse.

Details emphasized

The hood design and "free flow" styling forecast future trends in automotive design. Tail lamps are recessed into tapered channels. The door outline is molded in and lines up accurately with a continuation of this detail which carries on up into the dome piece and defines the windows. The name "Timely Turnabout" is hot stamped on both sides of the body near the front.

Three slots molded in the top of the body piece provide anchorage for extensions on the dome section. The three bosses which anchor the motor in position are especially rugged and are cored to receive Parker-Kalon self-tapping screws.

The dome is molded of clear polystyrene or colored Tenite II. It is made in a 12-cavity combination mold which makes four tops and eight headlights on a single sprue. All gates are trimmed simultaneously with a specially devised cutter.

Concealing the gate

Gating of the dome was a ticklish proposition since it was necessary that the gate be concealed in the finished car. The part was gated at the front lower extremity just ahead of the small rectangular section which goes beneath the cowl of the body, locking the dome in position. Two lugs toward the back of the dome extend down through molded-in slots in the body and the entire dome is secured in place by either one of two methods—snap fit or hot pressing the lugs so they cannot be withdrawn. No cementing operation is involved.

To provide the effect of the roof, the domes are masked and sprayed on their inner surface with a silver lacquer developed especially for polystyrene; domes are also supplied in colored Tenite II.

View of under side of car shows fifth wheel in center which turns car when front wheels run off table edge

Main plastic parts of the toy are shown here. Dome is molded of transparent polystyrene. Inner surface is masked and sprayed with silver lacquer to make an opaque roof. Three extensions of dome fit into slots in butyrate body section. Three bosses in body section are cored for self-tapping screws to hold motor in place. Trade name is hot stamped

Extruded flexible plastics, when properly compounded and fabricated, find wide use in trimmings and uppers for shoes

When Extruders Market Products

by K. GENEREUX AND D. H. GARRISON, JR.*

IN the early days of the production of extruded flexible plastics—only some eight years ago—the technician concentrated on his extrusion machinery. He learned little tricks about die design, cooling media, take-off devices. Each little trick became his stock in trade—his "top secret." The extruder's customers in those days were the Army, the Navy, and five or six large aircraft companies. He had a small overhead and no sales problems. His main worry was extrusion technique but even at this early stage a few far-sighted companies realized that a knowledge of the chemistry of compounding and of compounding in the extrusion plant were indispensable for manufacturing a product of constant quality.

After the war's end, it was found that technical skill in compounding and extrusion, along with established development and testing laboratories, were a firm foundation upon which to build new consumer applications. However, at least equally important were product design, market research, and distribution.

The laboratory

During the war years, the plastics extrusion industry received valuable assistance in compound evaluation and test methods from the United States Navy, the National Aircraft Standards Committee, the American Society for Testing Materials, and many others. Extruded plastic tubing was being used in many military applications which required constant compound improvements. For example, high altitude flying demanded a compound which would withstand the heat and humidity of a flying field in the South Pacific, yet which, only minutes later at high altitude and —70° F., would not shatter when struck by a projectile. Accordingly, compounds were formulated which maintained their low temperature flexibility and brittleness point after long and repeated exposure to the heat of the tropical sun. Such experience proved valuable in developing a plastic for peace-time garden hose.

With the end of the war, many specifications and test methods had been established, but they were often not suitable for the new consumer applications for extruded plastics which sprang up overnight. Tensile strength, drape modulus of elasticity vs temperature, and the "leathery properties" became important in making some products. Evaluation of the compound in terms of the finished product made complete revision of accepted testing procedures necessary.

Compounding and compound evaluation were

*Vice-presidents, Industrial Synthetics Corp.

faced with new problems: colorfastness, plasticizer migration, and surface appearance are typical examples. Heretofore, compounds had been produced in transparent, black, and standard NEMA colors. Now thousands of compound evaluation studies had to be made on pigments suitable for producing a wide range of colors, on stabilizers for resistance to light and heat, and on plasticizers for physical and mechanical properties. New dispersion techniques for pigments and stabilizers, incorporation of color master batches in carefully ground pastes, and new blending and milling techniques had to be developed to impart improved surface appearance to such materials as Eastern high gloss patent.

Extrusion technique and inspection

Requirements of improved surface appearance and homogeneity of compound, especially in fairly heavy cross sections, made improved extrusion-machine design imperative. In 1943 we started a long range development project on a tapered cylinder extruder, without the knowledge at the time that similar experiments were going on in Germany. "Secret" plans are not always secret. Natural evolutions are seldom isolated to one country or one manufacturer.

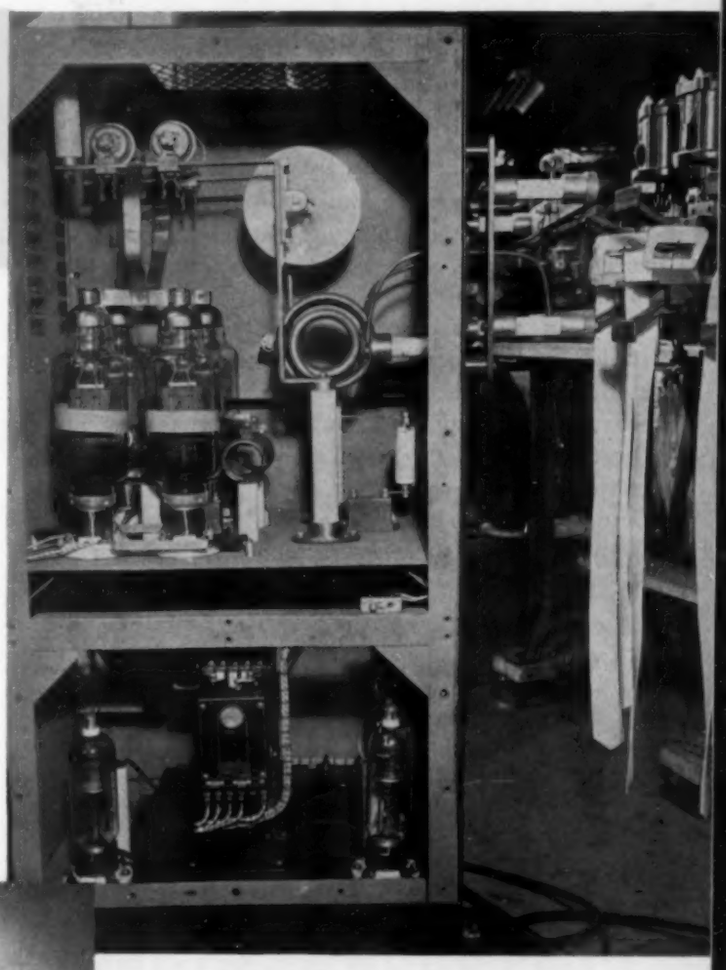
The problems involved go beyond basic technical skills to embrace important aspects of design, distribution, and assurance of consumer acceptance

Specially tapered cylinder

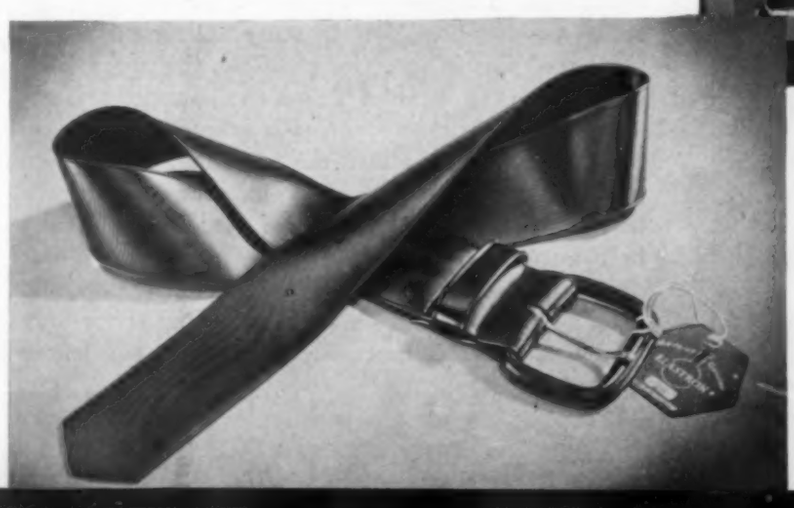
Conventional extrusion equipment had never solved some very important problems such as positive propulsion without backflow and the greatest possible elimination of uncontrolled friction heat. In a specially designed tapered cylinder extruder greatly reduced clearance is obtained between screw flights and cylinder liner. Because of this, there is less possibility for compound to accumulate and to burn and/or peel off. With the tapered screw, the highest surface speed is encountered when the compound is cold. Moreover, as the compound becomes plastic it reaches a point on the screw flight where the surface speed is reduced, thus lowering frictional heat and eliminating decomposition. This extruder design has been instrumental in solving the problem of uniform surface finish on end products.

The tapered cylinder extruder offers other advantages in covering wire or other types of cores with jacketing since there is reduced "wobble" or "whip" in the screw. Straightline covering can be used and no crosshead is necessary.

In post-war work, an inspection problem was encountered which required complete re-education of the staff. Inspectors trained on electrical insulating extrusions for military use had been interested in



Equipment for electronic sealing of flexible extrusions. The radio frequency generator is shown at the left and a belt sealing fixture at right



Even the buckle of this extruded plastic belt is covered with an extrusion. The seams are heat sealed; no sewing machine stitching is employed

dielectric and tensile strength, and in dimensional checking with little emphasis on surface appearance. Their tools had been gages, micrometers, and calipers. Now, when striving for high quality finishes, the human eye became more important than ever as an inspection tool. The inspectors had to be trained to reject pieces having variations in luster, small die lines, and dispersion imperfections, in addition to checking dimensional variations.

Post fabricating

By the time the war ended, many industries were looking upon extruded flexible plastics as a fill-in until leather returned to the market. One of these was the shoe industry. With their background in leather, however, they insisted on fabricating plastics by the same methods as were used for leather. Since there were no satisfactory adhesives for vinyls, the sewing machine was used. There is no doubt that this most versatile of machines has ruined a large number of otherwise good plastics applications. It seemed impossible to convince the shoe manufacturer that his sewing would not work. There was a hungry market for low cost shoes and apparently the only interest was in getting them on the market before competition. Within a year after V-J Day there was virtually no more market for extruded plastics in the shoe industry. But the market is returning as well designed and properly fabricated shoes are produced and adequately marketed.

A few manufacturers of inexpensive shoes installed dielectric sealing equipment and were immediately faced with other serious problems. If extruded stripping was bought from three suppliers, three different sealing cycles became necessary. For example, there was one manufacturer with a particularly well designed shoe who bought plastic soles from one producer and stripping from another. He had costly delays when the two could not be sealed with his fixtures. In this case it was difficult to assist the manufacturer since he refused to reveal the design of his fixtures.

Many manufacturers were so certain that they had a "brand new use" for flexible extruded plastics that they refused to divulge the application, bought stripping which was poorly designed or improperly compounded for the application—and produced another end product which hurt the plastic industry.

The difficulty of working under such conditions convinced some sections of the plastic extruding industry that success depended upon designing and manufacturing certain finished products themselves whenever frank collaboration with product designers and engineers was not possible.

Product design

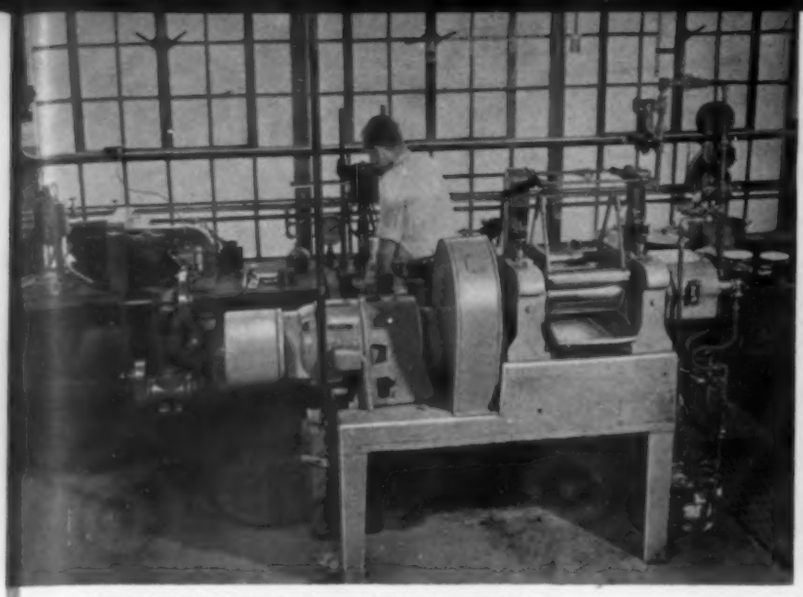
One of the greatest problems encountered was in overcoming traditions in design, which had been set up for previously used materials, to permit the use of the properties of the new flexible plastics to their fullest advantage. In product design using these new and better materials, the easiest procedure would have been to follow the line of least resistance and imitate the appearance and styling of products made from the older materials such as leather and rubber. However, if this had been done, many of the advantages of the new materials would have been lost. A typical example of this problem is the design of garden hose.

A ½ in. Supplex hose does the same job as an ordinary rubber hose of ⅝ in. more because the mirror-like smoothness of the inner surface of the plastic hose offers less frictional resistance to the flow of water. Then, too, the bore is not reduced in time by mildew, rot, and oxidation. Furthermore, 90% of all garden hose connections use ½ in. pipe. These are the basic reasons why a well made plastic garden hose does not require a bore larger than ½ inch. There is also better bursting strength, better kink resistance, lighter weight, and lower sales price than for similar hoses of larger bore.

Plastic garden hose merchandising includes a guarantee registered with the manufacturer and a "thank you" note

Compounded and extruded

New and better manufacturing processes, control of quality from compound to finished product, and the use of the proper compound for a given application are now possible. In our plant for the manufacture of plastic belts, for example, the proper material for the application is both compounded and extruded. The buckle covering is extruded over wire, contour-grained to match the stripping, and formed into buckles at the end of the extruder. In a continuous assembly unit, one man feeds an automatic belt cutter which cuts 18,000 pieces per 8-hr. day, and 14 women seal buckles and loops, tags, and pack 18,000 pieces in an actual working space only 30 by 30 feet. The electronic sealing equipment



ALL PHOTOGRAPHS IN THIS ARTICLE COURTESY INDUSTRIAL SYNTHETICS CORP.

This plant laboratory, with its compounding mill, molding press, and one-inch extruder, brings forth the answers to constantly recurring questions

A modern extruder, with electronically controlled heat zones, gives uniform surface finish on end products

used in this production process was so well designed that it is giving trouble-free and uniform production.

Merchandising

There were other problems, however, other than those of production. An entirely different type of customer had to be considered. Thinking had to be streamlined. No longer was the customer a procurement engineer. He was a buyer, a merchandise manager, a retailer. He did not know nor did he care about stresses and strains set up in extrusion. He wanted to know such things as: How many colors does it come in? Is it priced right? Can I get the mark-up I need? Will my customers buy it? In some cases he forgot to examine the quality. Many bought riveted plastic baby harnesses which ripped apart, plastic patent handbags which lifted varnish from the counters, belts which stretched to ridiculous lengths, and suddenly these people stopped buying. But the buyers who had bought wisely have become today the foundation of a multi-million dollar industry.

The program of educating the public began. However, some wise manufacturers thought it necessary to educate the retailers first. These retailers had to be convinced that most plastic manufacturers conduct their experiments in the laboratory and in field tests and not at the expense of their customers. When selling was done direct to the retailer, he got the story first hand from the manufacturer's sales representative. In the case of Supplex garden hose, for example, the retailer approved of the guarantee plan which invited the customer to register his guarantee with the manufacturer. The retailer recognized that although most products are guaranteed, the purchaser often feels that this is merely a "sales getting" technique. In this case, each customer who registers his garden hose guarantee with the maker receiver an acknowledgment and a "thank you" note.

This method of selling may be unconventional, but it was being applied to a new product and close contact with the retailer was deemed necessary. Market research shows that there are some 30,000 hardware stores in the United States. More important than a distribution set-up which gets 90% of them, is to convince 15% of them that plastic garden hoses are here to stay and are made by manufacturers who are not "fly-by-nights". When this is established, other products of these manufacturers are sold with confidence by the retailers and bought with equal confidence by the consumer.

Many a plastic manufacturer has been led to grief by ambitious promotors who offer to take up his entire production. Demand for his product is sensational. He expands and continues expanding until warehouses all over the country are bulging with his products. Then he gets no orders until the public consumes the warehouse stocks. Sometimes he is not financially able to mark time, and as a result, very often he finds that he has expanded beyond all normal demand for his product.

Extruders of plastic materials must always remember that they are part of an industry whose very product is in competition with older and proven materials. Every product put on the market must be designed and engineered to advance the prestige of the plastic industry. Better quality must be given, not at the *same* price, but at a *lower* price. The problem is not one of polyethylene competing with vinyl, for example, but of cheaper leather, rubber, etc., competing with both of them. The public must use the products before they can be convinced that they are better than rubber or leather, but the public must also be able to afford to buy them.

Battery Vent Plug Gives Visual Warning

THE optical qualities of transparent polystyrene are used to good advantage in a new storage battery vent plug which makes it possible to check an automobile battery at a glance without removing the plug. The words "Add Water" can be seen through the transparent head of the plug if the electrolyte level is low, but black disk appears in place of the words when cells are full.

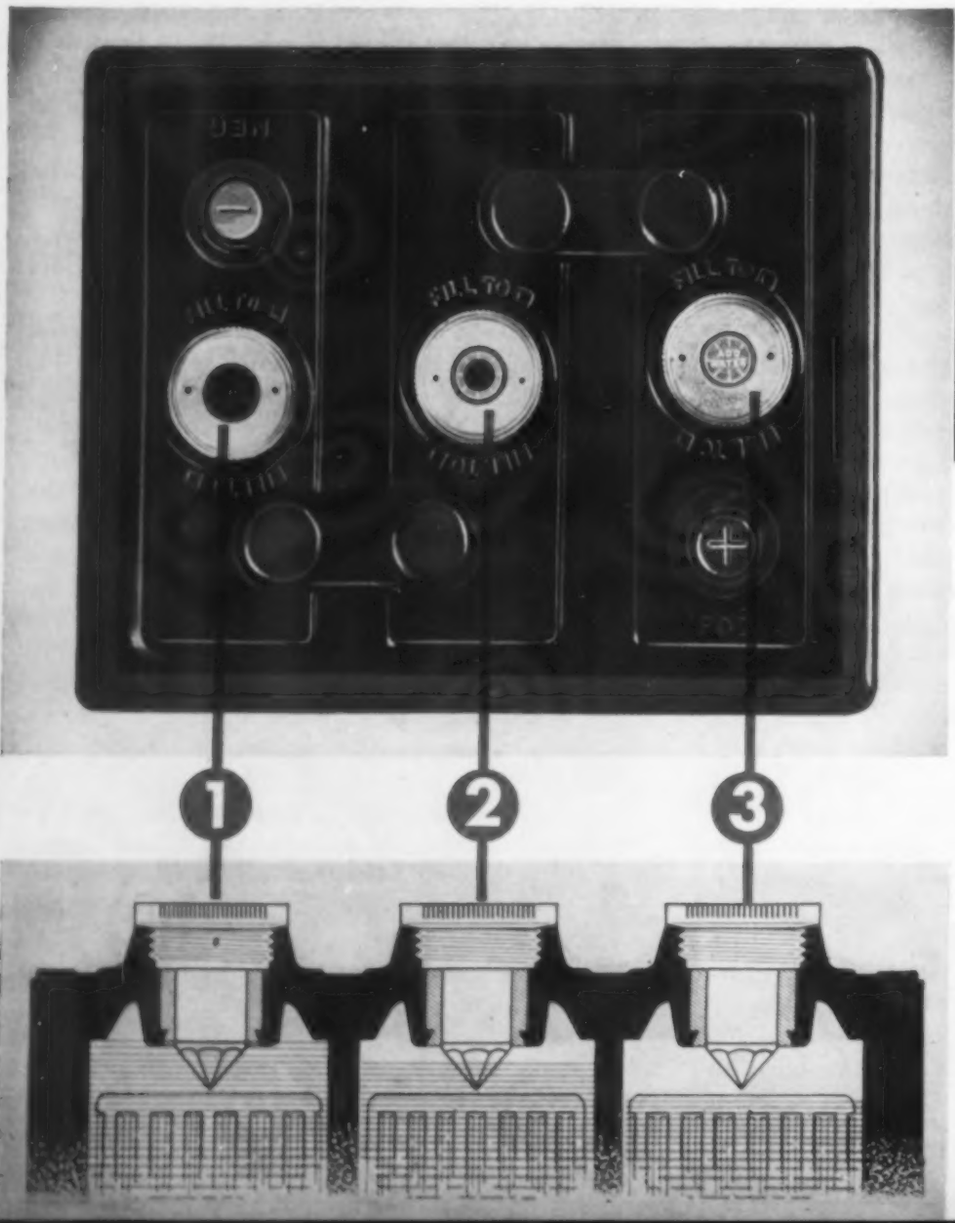
The plug, called Televel, was developed by the National Battery Co., St. Paul, Minn., in cooperation with the molder, Minnesota Plastics Corp., St. Paul.

Plastic prism refracts light

The bottom of the vent plug barrel is actually a prism which refracts light when not in contact with the electrolyte. The cutaway diagram and the photograph illustrate the operation. In cell No. 3, the electrolyte has reached a dangerously low level; the prisms refracts light, the bottom of the barrel becomes clear, and the warning appears. In cell No. 2, the electrolyte is low, but not dangerously so; only a small part of the warning appears. Cell No. 1 shows the electrolyte at the proper level; this condition is indicated by a black disk in the barrel.

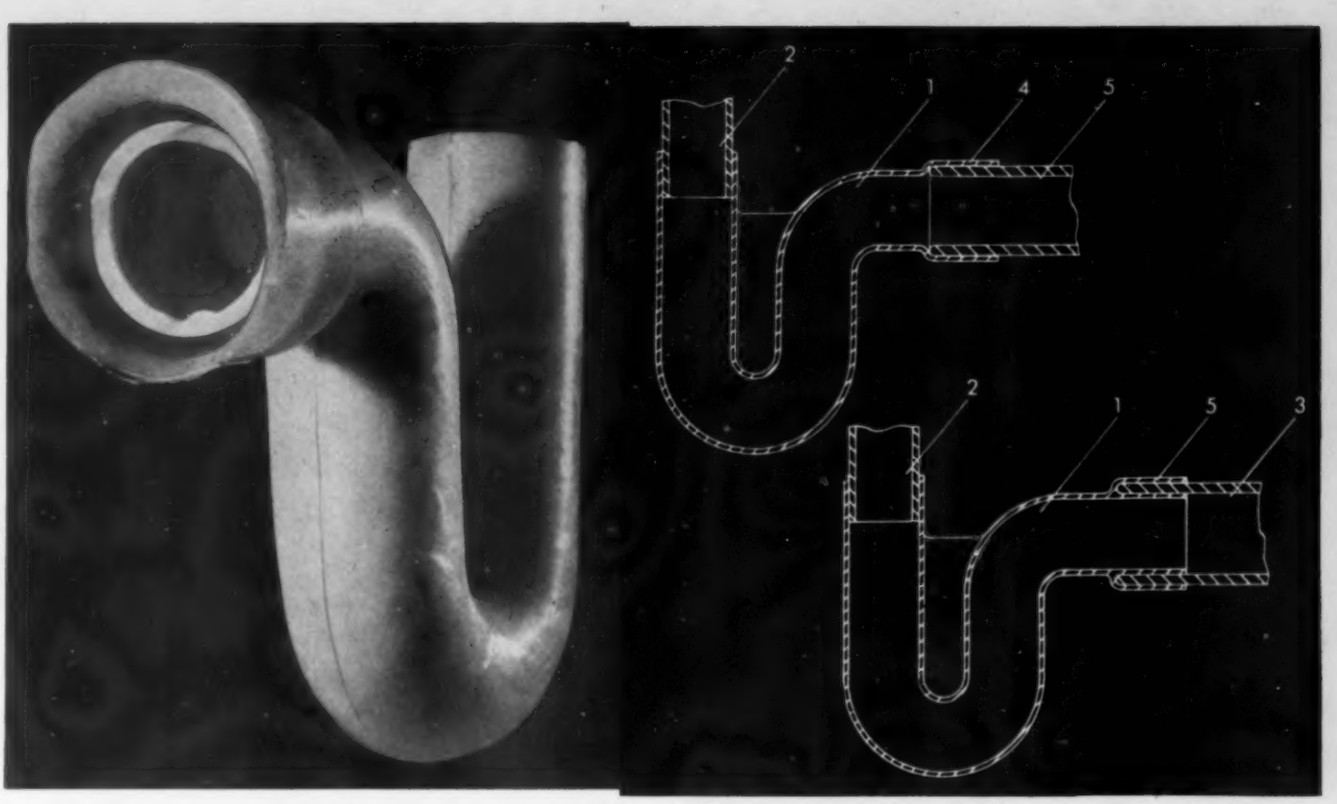
The Televel plug is molded in two pieces. The central stem is hollow and has the words "Add Water" molded into the inner surface of the faceted bottom. The top section is threaded to screw into the battery and milled around the edges for easier turning. Each piece is molded in a 10-cavity die.

The Sales Department of National Battery Co., which originated the idea for the Televel plug, has found the new plugs an important sales aid because they make the battery easier to maintain and because the crystal polystyrene plugs improve the general appearance of the battery.



Liquid is at proper level in cell No. 1, but when, as in cell No. 2, level drops slightly a black circle surrounded by a ring of refracted light appears in the central barrel. However, the level is not dangerously low until the words "add water" appear as in cell No. 3

Threaded neck and milled edge by which the plug is easily rotated for removal are shown in the close-up of the new polystyrene vent plug



Flexible polyvinyl chloride sink trap needs no cleaning vent. Blockages can be removed by squeezing and bending the trap. Two types of exit end are made. One shown in lower sketch fits inside drain pipe while tubular extension of the plastic fits over pipe

Flexible Sink Trap

A NEW use of plastics in domestic plumbing, a flexible polyvinyl chloride sink trap just announced in England, was developed by R. L. Stephens and C. Mouritz, of the Welwyn Laboratories of Imperial Chemical Industries Ltd.

The plastic trap provides the same water barrier against noxious gases and odors as does the conventional metal trap, but without some of its disadvantages. The inner walls of the plastic sink trap are smooth and allow uninterrupted flow. In addition, the plastic trap is flexible, making it possible to remove blockages by squeezing and bending the trap. It can be slipped onto a sink outlet to form a spigot and socket joint requiring no sealing.

Two types of exit end

The exit end of the plastic trap can have one of two forms, both of which avoid a reduction in the bore of the drainage system in the direction of flow. The drawings above show these two methods. In the upper sketch, 1 is the plastic trap, 2 the sink outlet, 5 the waste pipe, and 4 the outlet end of the trap. Here the exit end of the trap is, for a short length, of greater bore than the bend of the trap so that the internal surfaces of the trap and waste pipe are flush. In the lower sketch, the waste pipe, 3, fits over the exit end of the trap, but a tubular extension of the plastic, 5, fits outside the pipe to form a leakproof joint.

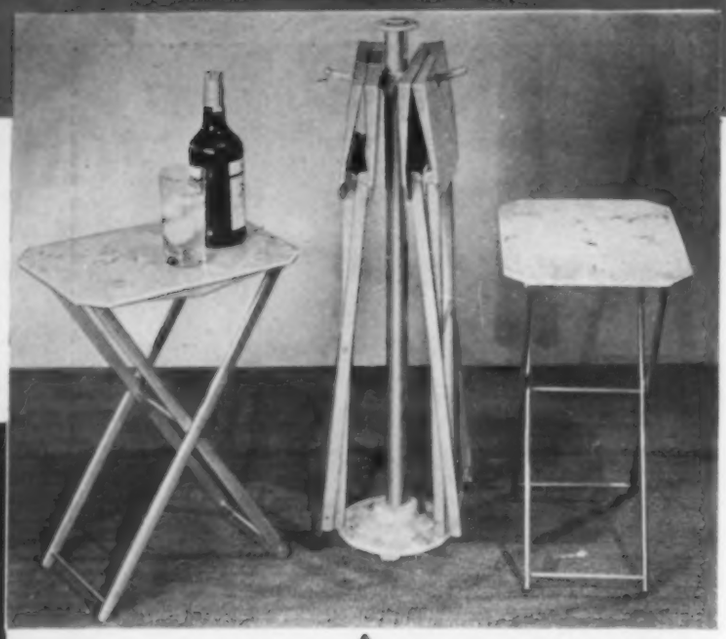
The specification for the sink traps calls for a "synthetic rubber-like material which does not swell when coated with grease and does not embrittle by oxidation, for example, a plasticized polyvinyl chloride or a synthetic rubber."

Polyvinyl chloride compositions suitable for the traps consist of between 15 and 60% by weight of a plasticizer (dibutyl phthalate, tricresyl phosphate, or dihexyl phthalate) and 75-40% by weight of vinyl chloride polymer or copolymer.

Method of manufacture

The vinyl sink traps are made by pouring the polyvinyl chloride dispersion into hollow split molds, heated to about 150° C. When the dispersion has partially gelled to a sufficient wall thickness from the surfaces of the mold, the bulk of the ungelled dispersion is poured out. The even gelling of the deposit in the mold is accomplished by rotating the preheated mold. The wall thickness of the gelled deposit depends mainly on the temperature of the mold and the time allowed for gelling, neither factor being too critical. The final gelling of the deposit in the mold is done in an oven, followed by quenching the mold in cold water.—*Paul Reilly*

With this baby's helper, mother can attend to other chores at feeding time. The bottle is clamped on the holder, moves in any direction at the slightest pressure. The holder is molded of Forticel by Lyndhurst Plastics Co., Lyndhurst, N. J., for Petti Products Co., Lyndhurst

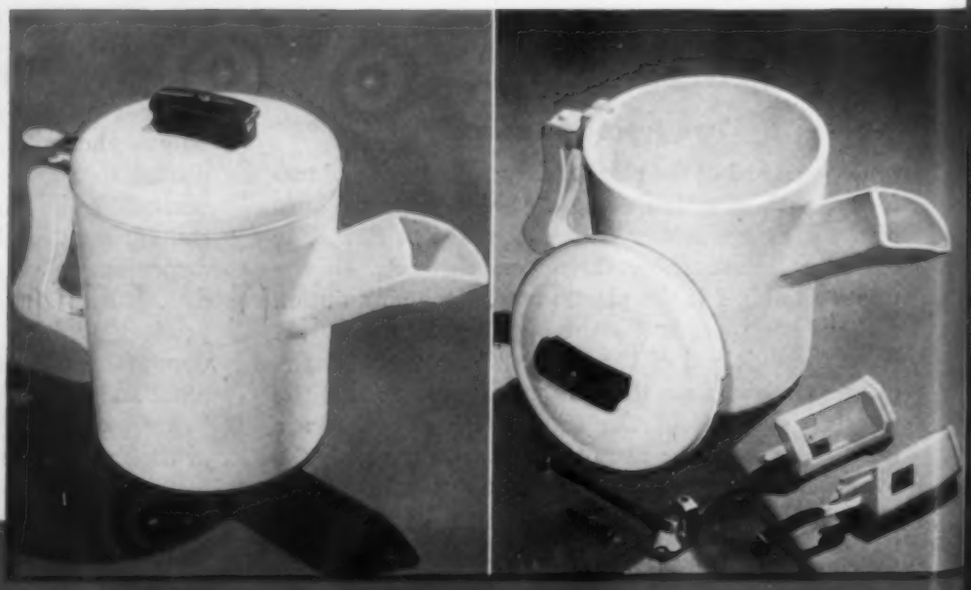


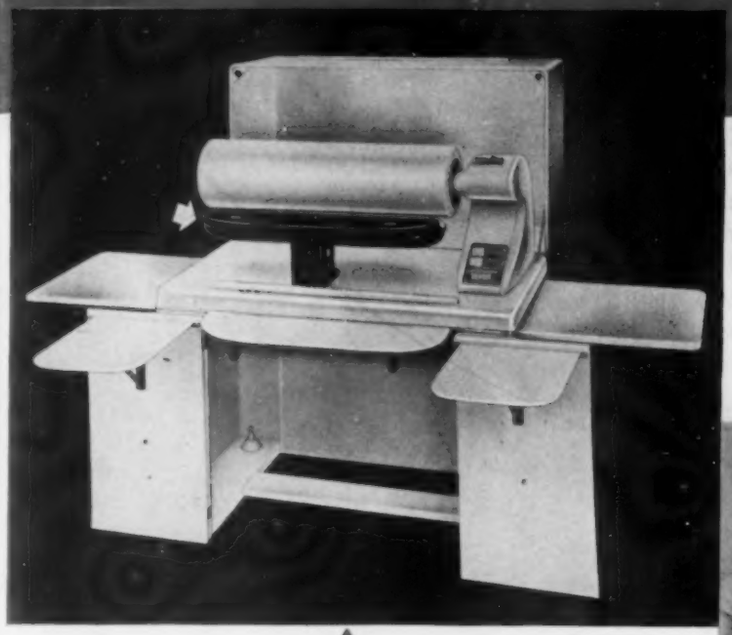
Homemakers in cramped quarters will welcome these Easy-Serve tables which stack compactly on a rack when not in use. Lustron polystyrene in bright colors is used for the two-part tops of the tables. The tubular legs and stand are made from painted compressed fiber board, cemented into place. Robinson Industrial-Crafts Ltd., 310 Wellington Rd. S., London, Canada, makes the unit

PLASTICS

Easy readability without glare, flowing lines, and an attractive ivory color enhance this addition to the Telechron electric alarm clock line. The hour figures are embedded on the circular dial, and an interruption indicator on the dial shows power failure. Northern Industrial Chemical Co., So. Boston, Mass. molds the clock case of Plaskon

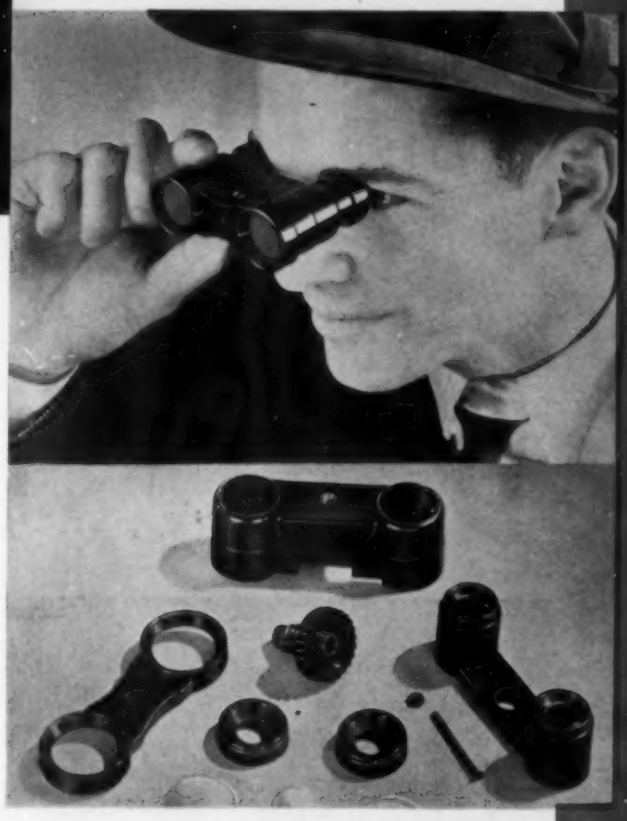
Cream can be neatly poured into containers with no danger of overflow with this new restaurant cream dispenser which is equipped with ¾ and ⅝-oz. cylinders. Thomas J. White Co., 7818 Weaver Ave., Maplewood 17, Mo., molds it of ivory Beetle for Cream-A-Ret Mfg. Co., St. Louis, Mo. This material is odorless, tasteless, and can withstand very hot water, thereby assuring a properly sanitary unit





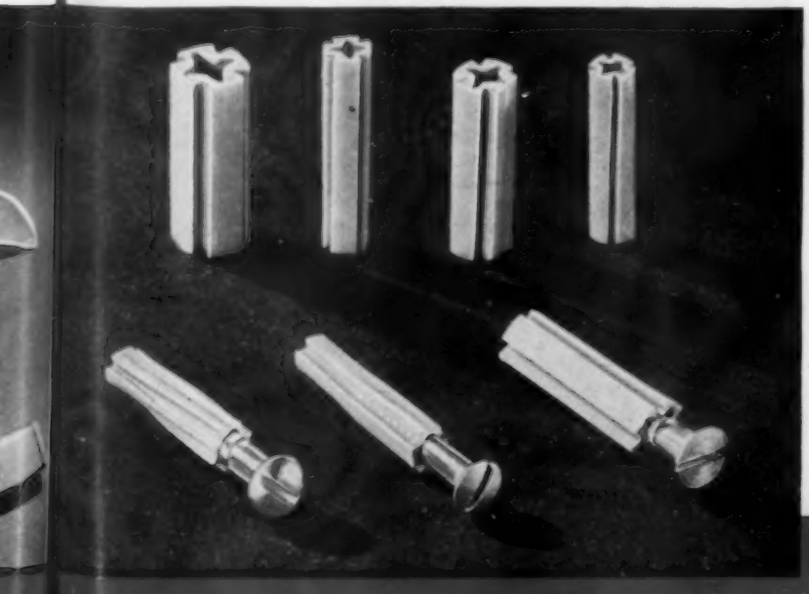
A smooth surface and clean lines feature the work table unit (arrow) produced from Bakelite phenolic for the new Bendix home ironer. Phenolic was chosen for appearance and ability to resist water, heat, and wear. The parts are molded for Bendix Home Appliance, Inc., South Bend, Ind., by Plastic Molders, Inc., 3670 Milwaukee Ave., Chicago 41, Ill. Machining operations, except tapping, were avoided

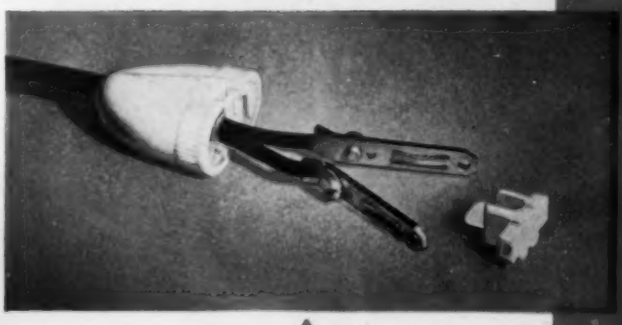
All six of the Bakelite phenolic parts in this Ringsider Sport Binocular are formed simultaneously in one mold by Woodmark Industries, Inc., 4061 Highway 7, Minneapolis, Minn. Ease of manufacture allows it to be sold at low cost. Disassembled binocular shows 12 parts



S PRODUCTS

For use with standard wood and lag screws, these plastic expanding screw anchors are available in seven sizes and in all lengths for screw sizes 5 through 20 and for ¼ and 5/16-in. lag screws. Holub Industries, Inc., Sycamore, Ill., molds them of ethyl cellulose supplied by Dow Chemical Co. They may be used indoors or outdoors. The overlapping internal center slits give needed expansion





The body of this easy to assemble electric plug is molded of Lustrex; the sealing plug of Lustron. Removal of insert unlocks metal male prongs and allows withdrawal for quick connections. Molded by National Products Co., 6100 Wilson Ave., Kansas City, Mo., for Sta-Tite Mfg. Co., 1016 Central St., Kansas City, Mo.

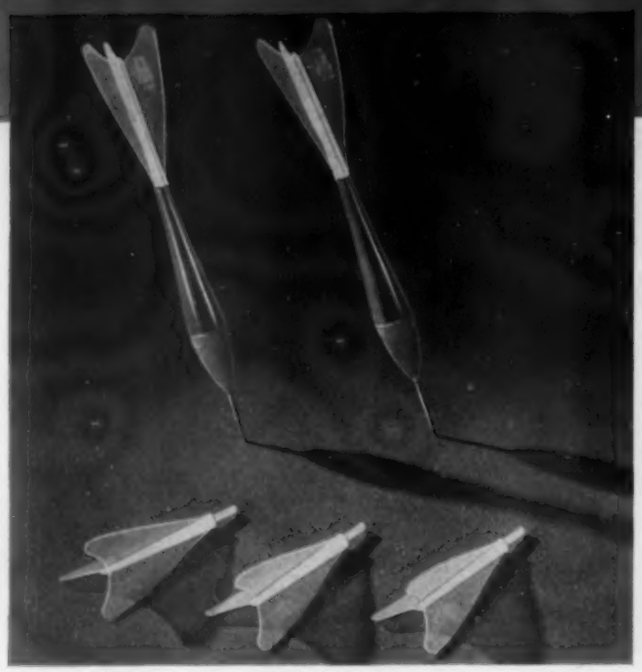
Watchmen find this watchclock easy to read, easy to carry, and sturdy enough to withstand long hard wear. The case is molded from high impact phenolic which was selected for its strength and appearance. The crystal is of Lucite. Simplex Time Recorder Co., Gardner, Mass., is the manufacturer of this new clock

Corners and edges of this Tenite II hotel-key tag will not bend or become dog-eared with handling. The tags are injection molded by United Plastic Industries, Vassar, Mich., for Plastic Tag and Trade Check Co., 115 Fourth St., Bay City, Mich. Lettering is heat stamped

Condition of the filter can be ascertained at a glance with this transparent Tenite container on the Clear-Vue Dustfoe Respirator, approved for protection against dust inhalation by the U. S. Bureau of Mines. Co-Jay Corp. Los Angeles, Calif., molds the container for the B. F. McDonald Co., 5112 S. Hoover St., Los Angeles 37, Calif.

PLASTICS

Waitresses working for the White Tower Management Corp. now wear these perky combs in their hair for advertising purposes. Fibestos molding powder is used to produce the comb and white Fibestos sheet stock is used for the top portion. The roll leaf is supplied by Peerless Roll Leaf Co., Inc., 4511-4521 New York Ave., Union City, N. J. E. B. Kingman Co., Leominster, Mass., manufactures item

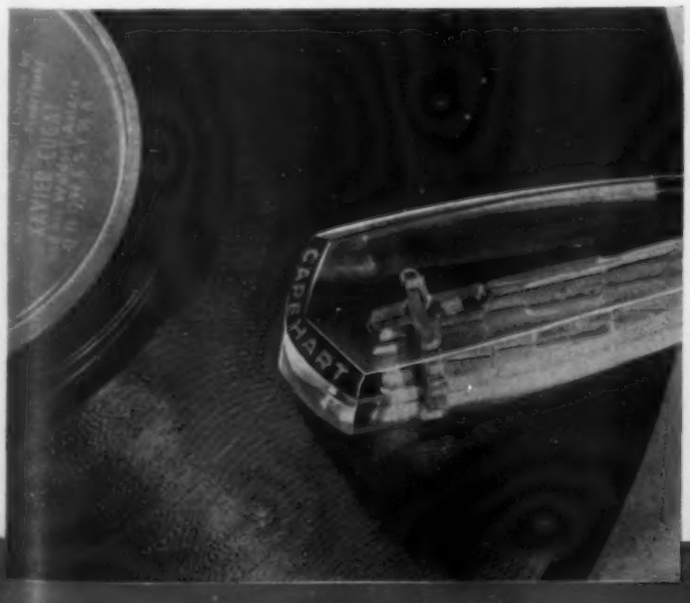


Hitting the bull's eye gets easier with these darts for the polyethylene tail section, unlike feathers, does not shed or become unglued. Too, it will bend almost double without breaking. Moldall Plastics, 4918 N. Lincoln Ave., Chicago 25, Ill., molds the bodies of polystyrene and the three-bladed fins of natural color Bakelite polyethylene

A toy cement mixer with movable parts is just the thing to help build that make-believe town. Dillon-Beck Mfg. Co., 1227 Central Ave., Hillside, N.J., molds the Wannatoy mixer of cellulose acetate for Smith-Benny Sales, 11 W. 42nd St., New York, national representatives for Wannatoys

PRODUCTS

Less than 1 oz. of pressure is exerted on the record surface by this Plexiglas pick-up head which is being used on the new Capehart and Panamuse phonograph-radios. Acrylic was selected for its light weight, shatter resistance, and clarity. This head, which contains the needle-holder assembly and is easily removable, is molded by Standard Molding Corp., 1517 E. Third St., Dayton, Ohio



Fatigue and efficiency loss from working under constant noise can be greatly reduced by Ear Defenders molded from a vinyl chloride resin specially compounded by Mine Safety Appliances Co., Braddock, Thomas, & Meade Sts., Pittsburgh 8, Pa. This material is used because of its non-toxicity. Rathbun Molded Plastics Corp., 290 Rochester St., Salamanca, N.Y., molds case of urea

The largest hobbing press in the plastics industry

Hobbed Cavities *by* Midland . . .

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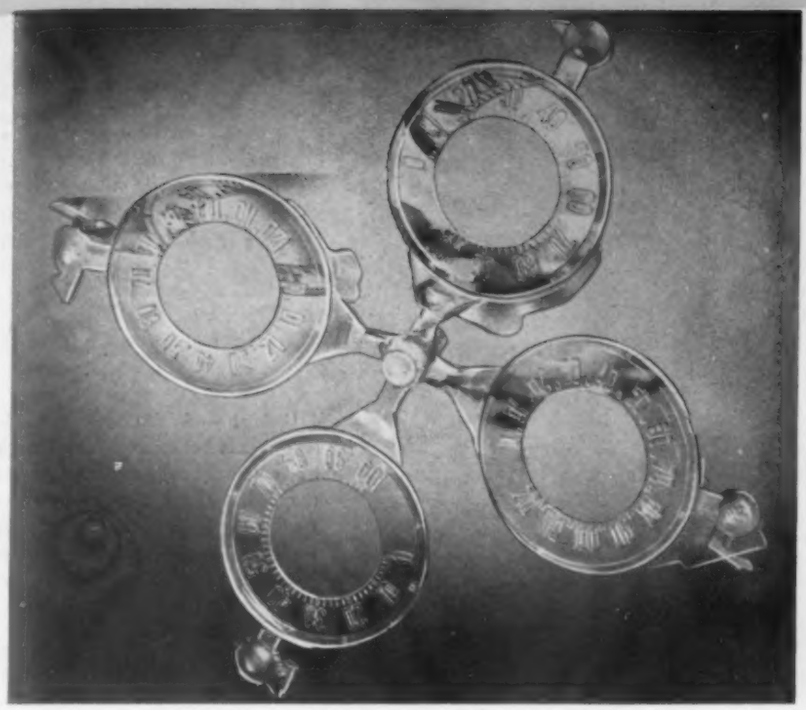


1 — A complete shot of dials from a four-cavity mold is pictured. Note the heavy runners and slugs directly opposite the fan gate on each dial. Also note that what is apparently heavy flash is really the result of additional venting

F. B. STANLEY, Engineering Editor

PLASTICS ENGINEERING*

Molding and Finishing Instrument Dials

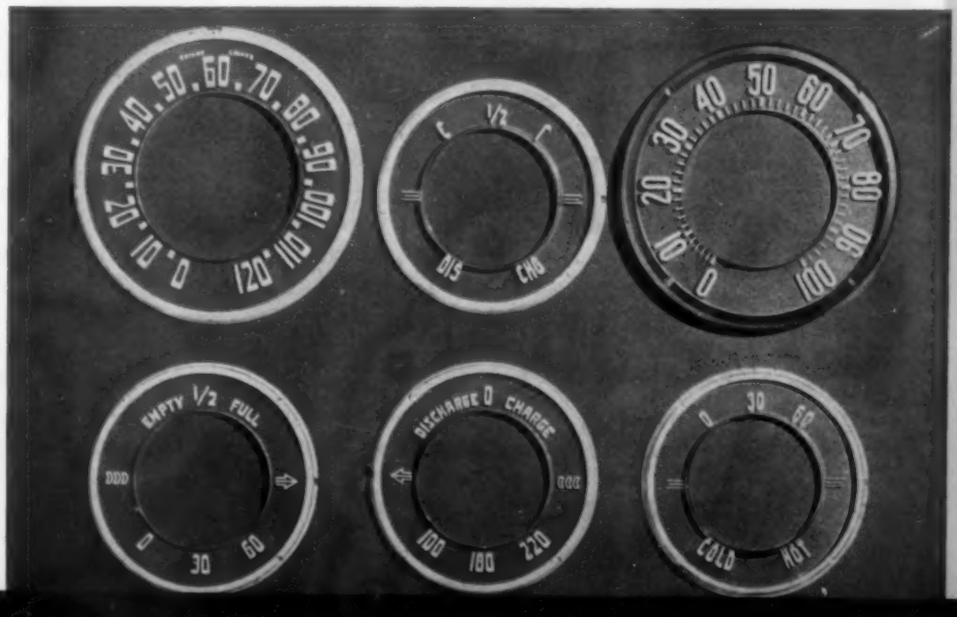
Difficulties involved in molding of acrylic dials and panels have been lessened by using multi-cavity dies with heavy runners and extra venting

by HERBERT CHASE

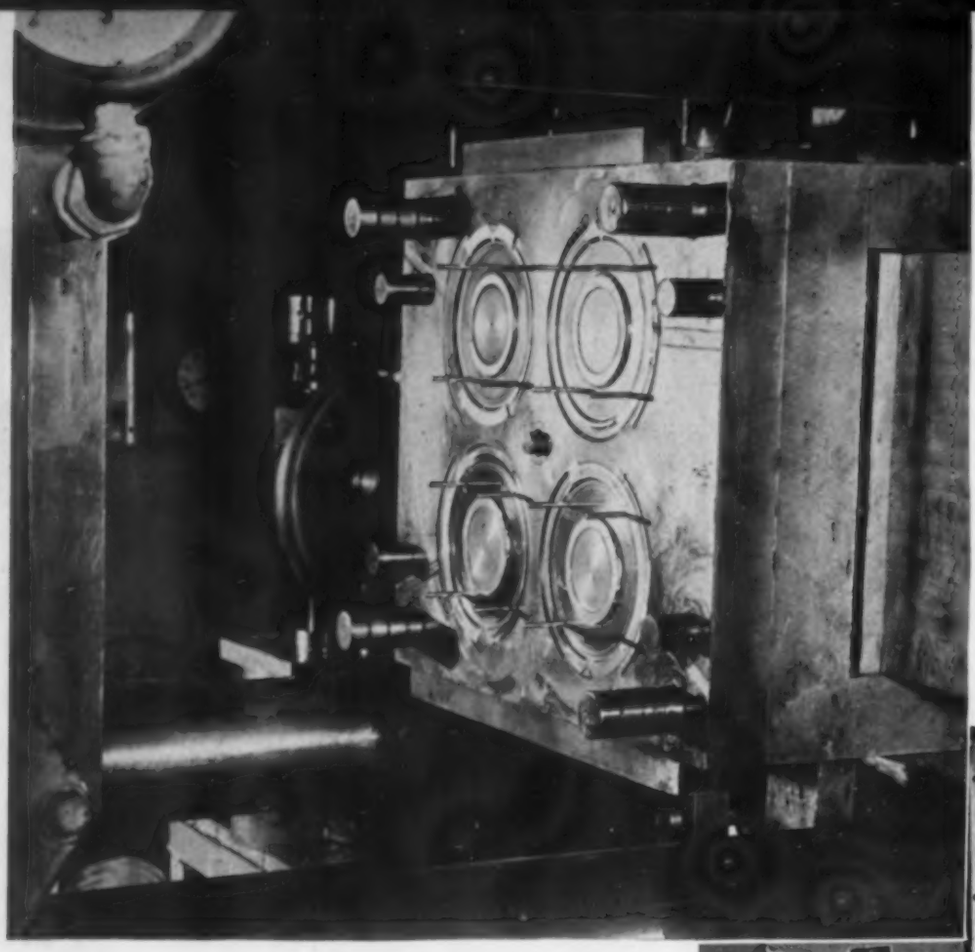
SEVERAL interesting mechanical expedients are employed to facilitate the production and finishing of clear acrylic resin dials for automobile instruments at one of the AC Spark Plug Division, General Motors Corporation plants in Flint, Michigan. This type of plastic was chosen for this use largely because of its clarity and ability to "pipe" light for illuminating the automobile dials at night.

Most of these dials include recessed numerals, letters, and scale markings (Fig. 1) that are filled in by spray painting. Edges and sometimes portions of flat faces are also sprayed, usually in white because white has high light-reflecting properties. If dial edges are painted white, for example, comparatively little of the light introduced in the plane of the

*Reg. U. S. Patent Office.



2 — A group of automobile instrument dials molded from acrylic resins is shown here. Dials may also be produced in other shapes, sizes. The recesses and edges are spray painted



3 (at left) — A close-up of half a four-cavity mold used for producing acrylic dials at a high rate. Beyond die is an arbor press for trimming flash from molded dials

4 (below) — While injection molding press in background runs through its automatically controlled cycle the operator has time to trim the flash from dials made in the prior cycle. A small arbor press equipped with a trim die is being used.

dial passes outward through the dial periphery but is reflected back and makes dial markings stand out more clearly, the light being "caught" by white paint in recessed areas.

Dials (Fig. 2) are produced by injection molding, commonly in multiple-cavity molds having channels through which cooling liquid composed of half water and half ethylene glycol is circulated. Such a mixture promotes better heat transfer. Such a four-cavity, center-gate mold is shown in Fig. 3. Molding cycles average about 35 an hour, a rate which is kept high partly by preheating the plastic to 180° F. in steam ovens before feeding it to the macnine.

While the machine used runs through its cycle automatically, the operator, in some cases, has time to remove flash from moldings made in the prior cycle. Often this is done with a trim die in a hand operated arbor press beside the machine, as shown in Fig. 4, while the moldings are still hot. In other cases, better flash removal economy is attained in punch presses, some of which are equipped with holders for four trim dies, the latter being made interchangeable so that the same holder can be used for dials of different diameters on the same centers. Such presses, of ¾-ton capacity, can trim all four moldings on the "gate" in a single stroke.

Mass production spraying

In paint spraying, as in other operations, setups are designed to attain the highest rate feasible and thus minimize the labor charge per piece. As shown in Fig. 5, for example, dials of one design are mounted on a vertical spindle under a simple mask and areas on both the top and bottom faces as well as the edge are sprayed from two fixed guns operating at the same time.

The simultaneous operations are performed in this instance on a flat ring-shaped dial which is placed on a flange at the upper end of a vertical spindle. A low boss on this flange centers both the dial and the mask

which is laid on top of the dial. When a pedal is pressed the guns start to spray and the spindle and parts thereon turn slowly so that all surfaces to be sprayed are properly coated. Spraying is performed, of course, inside a spray booth.

Areas to be sprayed on the top faces of such dials are groups of numerals spaced quite a distance apart. These areas are under the mask openings. No effort is made to confine the spray to the numeral recesses alone, because spray deposited on restricted flat areas between and around the numerals is removed subsequently in the buffing operation.

Masks are of metal and require occasional cleaning in solvent, one being put to soak while another is in use. The finish applied contains a white pigment and, besides other ingredients, enough solvent to "bite" into the plastic and thus promote good adherence. After being sprayed, dials are hung on a chain conveyor where they dry in passing through hot air blast. They are removed at the buffing station.

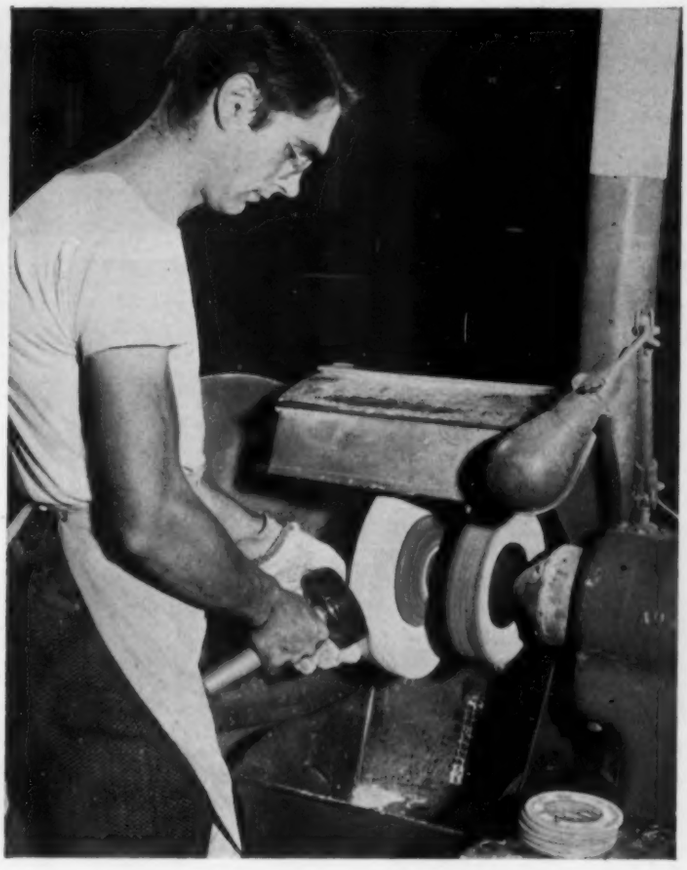
5 — For spraying, masked dials are supported on flange of slowly rotating vertical spindle. Paint is sprayed from two fixed guns

Excess paint removed

Buffing is done on muslin wheels that turn at a peripheral speed of 2,000 ft a minute. The wheels are charged with a chrome type buffing compound. For circular dials, a spinner holder is employed, as shown in Fig. 6, which permits the dial to turn about its own axis and brings all areas of the face to be buffed in contact with the wheel. One buffing operator keeps pace with the spray operator at this step in the operation.

Spinner holders are made of fiber, the under face being recessed to receive a bearing that fits the end of the handle. On the front face of the spinner is a recess to fit the dial, as shown in Fig. 7. The central boss that fits the hole in the dial is made of glass to provide a hard smooth surface which resists wear and does not cut or discolor the wheel.

6 — Dial is held in a rotating fiber spinner while being buffed. The wheels are of muslin and charged with a chrome type buffing compound



No metal can be used here because, even if hardened, it would tend to discolor the wheel with adverse effects on the plastic being buffed. Only the top face of the dial requires buffing and, as painted edges and recessed numerals are not touched by the wheel, the paint on these is not affected. The final operation on the dials is to wipe them with a cloth by hand to remove finger marks and any lint or traces of compound left by the wheel.

Since not all dials produced in this plant are

7 — Close-up of the fiber spinner with dial about to be placed in the annular recess surrounding the central glass boss. Glass is used because metal would discolor wheels

9—In the semi-automatic cleated belt polishing machine, dials are placed in shallow recesses in fixtures. They are advanced by the belt under the polishing wheels. The fixtures themselves are returned to the starting point by conveyor in the foreground

8—Excess paint is removed from this panel by a machine equipped with a belt driven "beater" with fabric blades

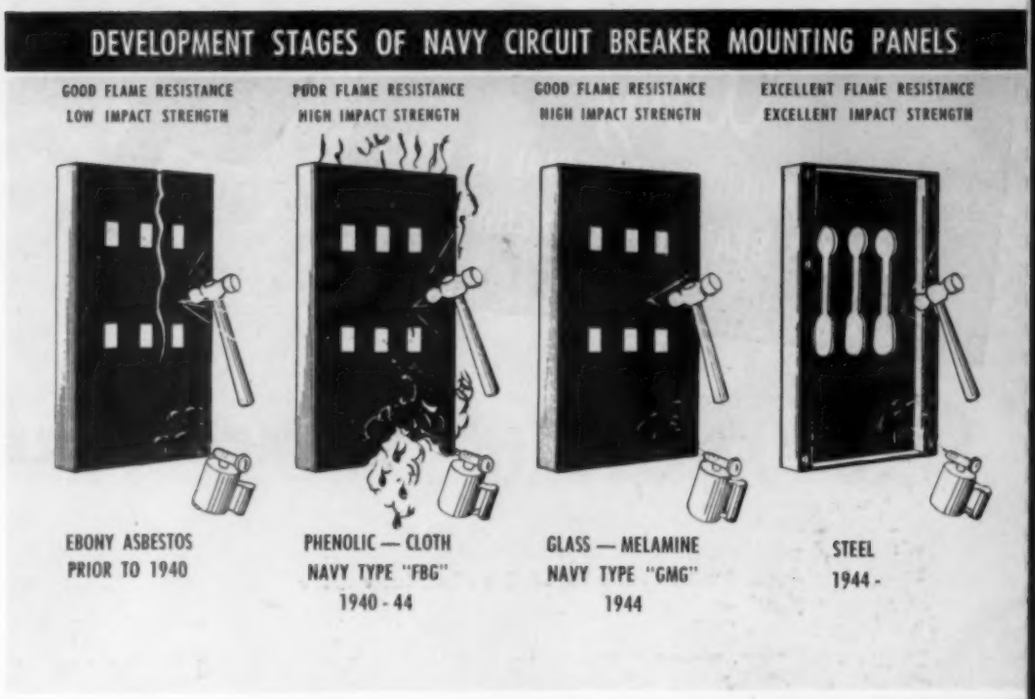
circular, different means of buffing, of removing excess paint, and of supporting the work have to be employed for other shapes. A special machine for such work, shown in Fig. 8, has a flat table with an opening in which a "beater" rotates.

In construction, the "beater" body resembles that of a cylindrical cutter designed for removable blades. In this case, however, the blades are of rubberized fabric rather than metal and project radially about ½ in. from the body. This machine is employed to remove excess paint from the under surface of such plastic parts as the oblong instrument panel which is shown in Fig. 8.

Here the flat surface to be cleaned is recessed into the back and has recessed letters, dial graduations, and numerals sunk below its face. These small recesses are filled in by spraying and the "beater" is used to remove excess paint between and around the small recesses, which it does without touching the paint in the recesses. To accomplish this, the operator moves the panel back and forth over the rotating beater which is viewed through the transparent plastic.

Machine with two buffer heads

Some oblong panels having flat faces to be polished are handled on a new semi-automatic machine, Fig. 9, that employs two oscillating buffer heads equipped with muslin wheels and fed with a chrome whiting compound. In this machine, each panel to be buffed is placed on a fiber holder made to fit the panel. When loaded, the holder is placed between cleats on a slowly moving belt that advances the holders, each with its panel in place, under the buffing wheels. At the end of the belt, the buffed panels are removed, along with their holders, and the latter are returned by a parallel roller conveyor to the station where the holders are reloaded and returned to the cleated belt for another pass under the buffing wheels.



1 — Commercial circuit breakers, in the beginning of their development, were mounted on wood. Then came marble, slate, and later ebony asbestos, which was satisfactory for naval use until requirements for shock resistance increased. Drawings at the right show progress from 1940 to date

by W. HAROLD EDMUNDS*

Plastics in Electrical Switchgear

PROGRESS in the electrical industry has, in general, been dependent upon the development of better insulation materials. In the beginning of the circuit-breaker industry, some 60 years ago, wood was commonly used as the mounting panel. This soon proved inadequate because of mechanical difficulties, such as warpage and cracking, and electrical troubles, such as charring of the surface which led to voltage breakdown. However, even with these apparent faults, wood was employed for many years.

Marble panels succeeded wood. Then, with the change from the open type switchboard to the enclosed type, in the late Twenties, slate became quite popular. It is inexpensive, easily machined, and inherently has good electrical properties if free from metallic veins. For commercial uses, it has a tendency to delaminate and chip if mishandled.

Up until this time rubber, fiber, asbestos, some ceramics, and cold molded materials were being used for other electrical insulation purposes. About the same time as the change-over to slate panels, laminated plastics and a limited amount of hot molded plastics came into use. The latter material somewhat revolutionized the circuit-breaker art and permitted designs which made the physical size of the breaker smaller.

Slate, used as the mounting means for the so-called "large air circuit-breakers," has poor physical shock resistant properties, and so it became necessary to obtain a material which would withstand shock conditions. Commercially, there is little need to worry about shock conditions, but for circuit-breakers to be used aboard ship, shock resistance is of prime importance. Starting about 1925 and continuing until World War II, practically all of the circuit-breakers furnished to the Navy were mounted on ebony asbestos. This material is fabricated from asbestos, cement, and other ingredients and is black in color. The

Generally speaking, the three factors to be considered in determining the type of insulation to be used in electrical switchgear are 1) mechanical strength, 2) electrical characteristics, and 3) economics. The first two factors are equal in importance; the third factor is considered after establishing the first two.

The accompanying article deals principally with the use of laminated and molded plastic insulation in such applications. It presents the factors to be considered in design and comments on present available materials as they pertain to this work. The materials discussed are by no means the only ones used, but are the ones primarily used in low voltage types of switchgear. In addition, many types of fiber, asbestos, wood compositions, ceramics, and rubber are used not only in low voltage switchgears but also in high voltage types.

*Electrical engineer, I-T-E Circuit Breaker Co., Philadelphia 30, Pa.

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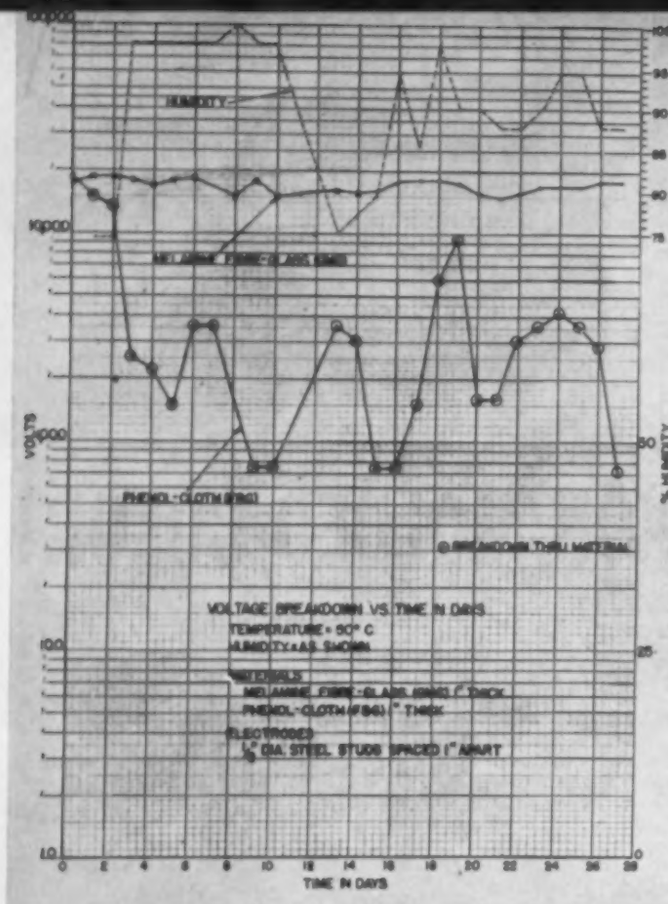
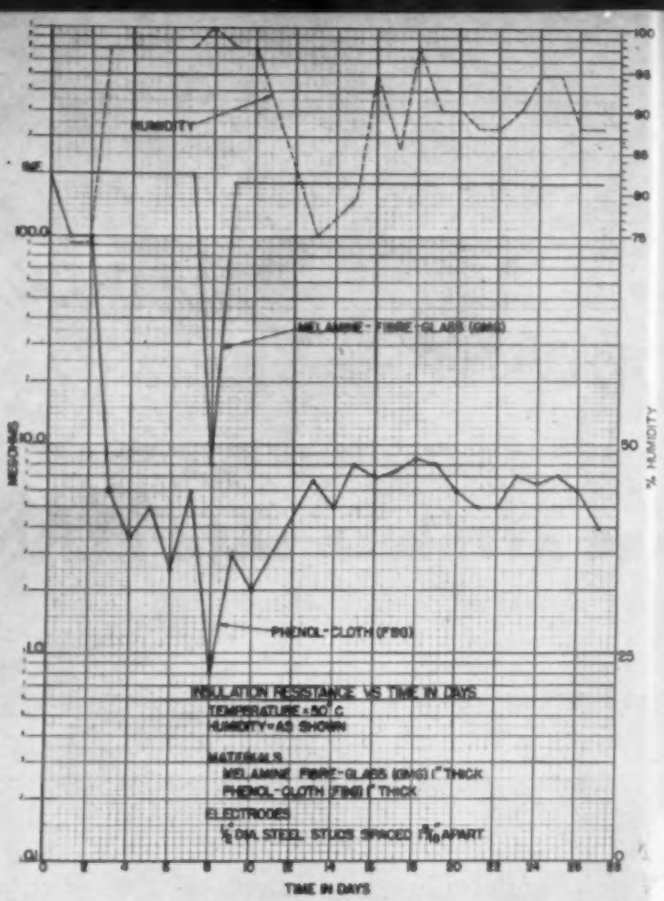
PLASKON
TRADE MARK REGISTERED
MOLDED COLOR

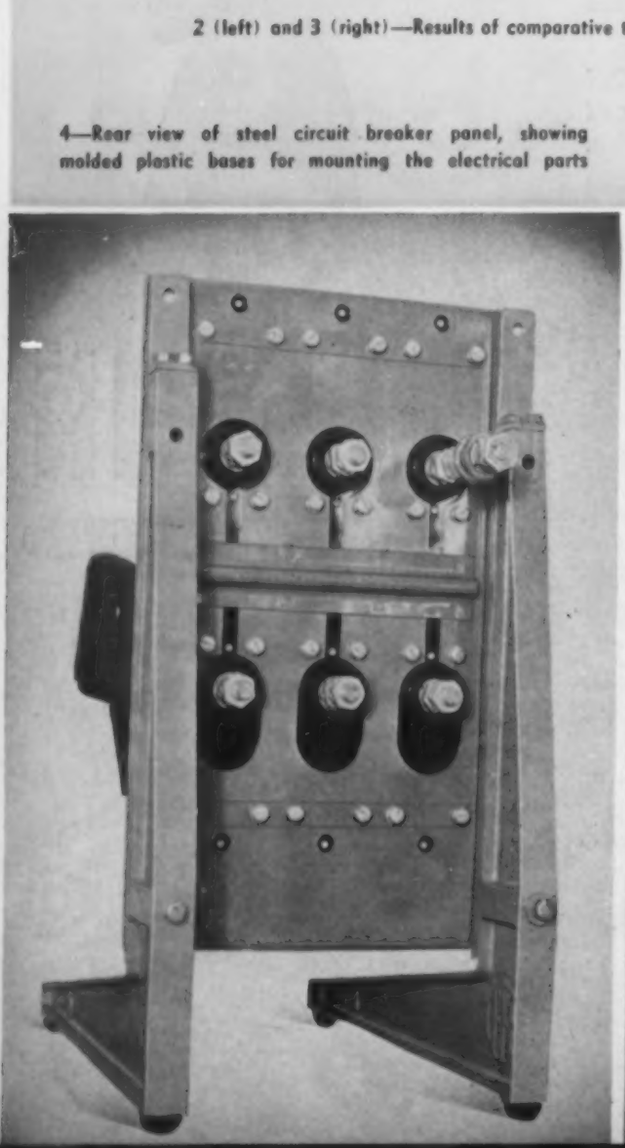
This line of dinnerware is molded by the Bryant Electric Co., Hemco Plastics Division, Bridgeport 2, Connecticut.





2 (left) and 3 (right)—Results of comparative tests on phenol-cloth and glass-fiber base melamine materials

4—Rear view of steel circuit breaker panel, showing molded plastic bases for mounting the electrical parts



5—Front view of panel with parts of the circuit breaker equipment mounted on the plastic bases which provide electrical insulation

shock requirement for these circuit breakers was 150 foot-pounds.

In World War II, the shock requirements rapidly increased until it was necessary for equipment to withstand shocks of 2,000 to 15,000 foot-pounds. Since ebony asbestos would not withstand shocks of these magnitudes, laminated phenol-cloth materials, Navy type FBG and FBM, were used. Experience in service soon showed that these phenolic resin bonded materials were inadequate in regard to heat, flame resistance, and electrical properties.

Figure 1 shows the development of Navy circuit-breaker mounting panels up until the close of World War II. The materials shown had been chosen because of their mechanical strength and a balance of other desirable properties, such as low water absorption and dielectric strength not obtainable in other laminated panelboard materials. However, the surface of phenol-resin materials can easily be carbonized especially if moisture is present. Generally speaking, any material that readily carbonizes under an electric arc will support combustion.

Shortly after our entrance into World War II, the Navy needed a flame resistant, less toxic, and better arc resistant insulating material for mounting electrical apparatus and for other insulating purposes. After considerable investigation and experimentation by various manufacturers of laminated materials in collaboration with the Naval Panelboard and Molded Electrical Insulation Committee, laminated glass-fiber base melamine was adopted as the material to be used for electrical equipment aboard ship. This material is known as Navy type GMG. It was interesting to note in the tests which were made that phenol-cloth materials made a very poor showing on all the electrical tests although the material had been used quite extensively in the past. Figures 2 and 3 show comparisons between phenol-cloth and glass-fiber base melamine materials.

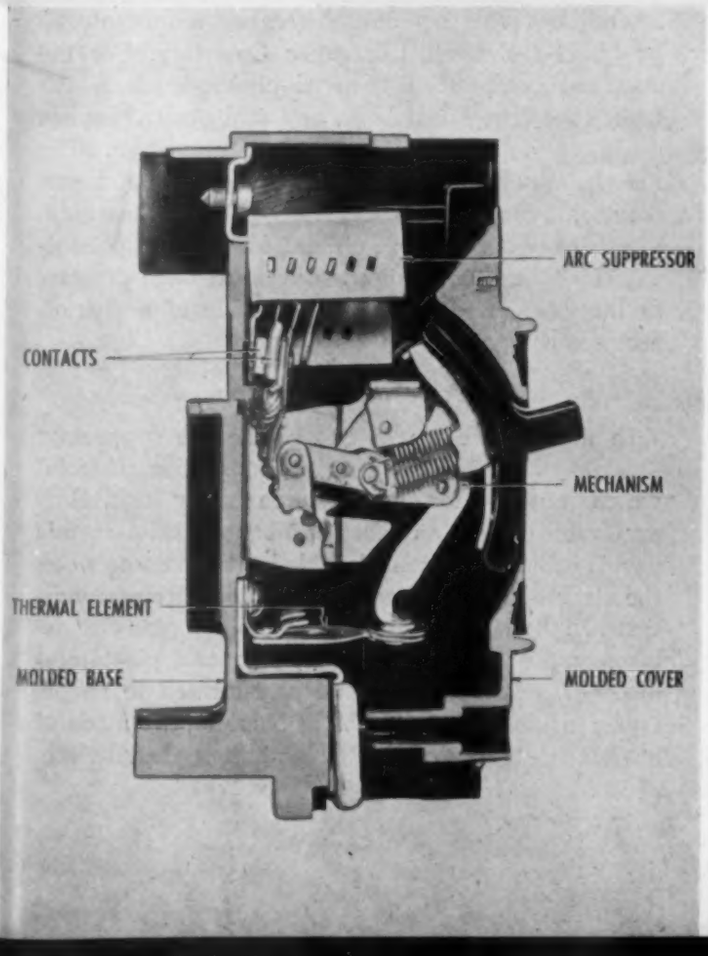
Flame resistant laminate

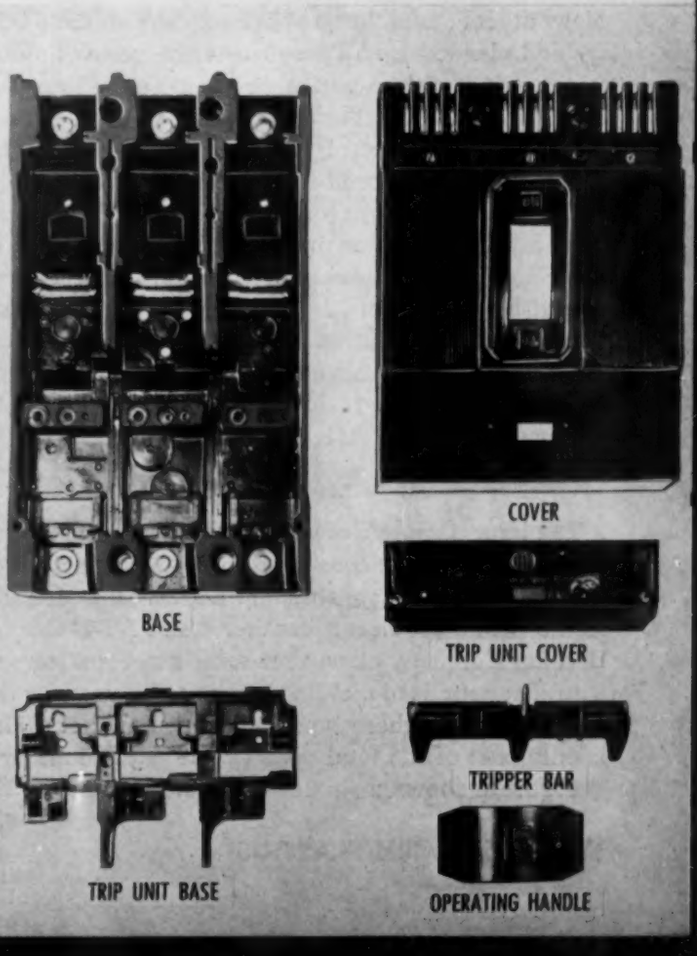
The choice of melamine resin was made because of its excellent flame resistant properties. The glass-fiber was chosen because it is an inorganic material, and the combination of the two materials produced a laminate which will not burn, support combustion, or give off toxic gases even though the material is subjected to a flame for several hours. These properties are not present in phenolic resin materials.

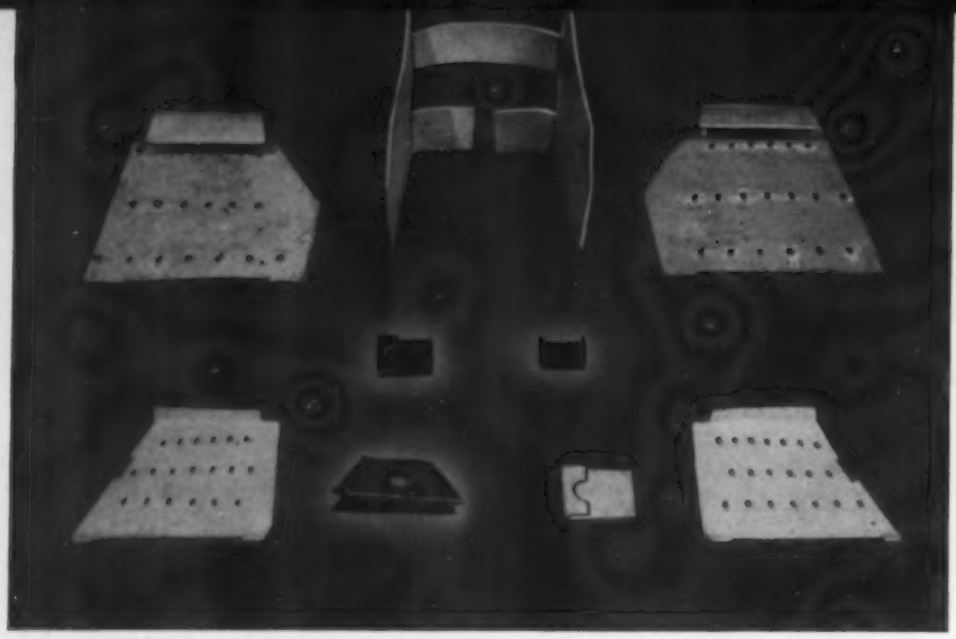
In addition, the mechanical properties are far superior to any other laminate available today. Its approximate tensile strength is 39,000 p.s.i. in the lengthwise direction and its approximate compressive strength is 90,000 p.s.i. in the flatwise direction. These figures compare favorably with those of steel. (*Please turn to next page*)

6—Base and cover of the housing for this single pole circuit breaker are molded plastic for strength and electrical properties

7—Molded plastic parts designed for use in a three pole circuit breaker. Materials used are described in the text







8—Examples of the intricate shapes into which plastic insulating materials are formed for use in big circuit breakers

The principal disadvantage of glass-fiber laminated melamine is that it is expensive, and so its commercial use may be limited. To offset some of the expense of glass-fiber materials, an asbestos laminate melamine was developed and used as insulation where strength was not a prime factor. This material was used in thin to thick sections for interphase barriers, arc suppressor hoods, shields, etc.

In the early part of 1944, the I-T-E Circuit Breaker Company developed for the Navy a large air circuit-breaker which is mounted on a steel panel. The panel (Fig. 4) is made of a special steel chosen to decrease the magnetic effect on the operation of the circuit-breaker. The overcurrent-device, upper terminal, blowout coil, and arc suppressor are mounted in molded plastic bases. These bases are made of melamine resins with asbestos or glass-fiber fillers for Navy applications. The wall sections are of such thickness that general purpose phenolic molding compounds can be used for commercial applications.

Figure 5 shows a front view of the panel with plastic bases mounted in place. The steel panel is protected from the arcing of the contacts, when the circuit-breaker opens, by placing a piece of melamine-asbestos insulation across the panel in the arc suppressor section. All circuit-breaker designs have not been changed to include this new steel mounting construction but work is progressing rapidly.

Large user of plastics

The largest volume of molded plastics in the circuit breaker industry is consumed in the manufacture of the molded case circuit-breaker known commercially as the "small air circuit-breaker." The I-T-E Circuit Breaker Company alone uses some three quarters of a million pounds of molding compound a year for the manufacture of these types of circuit-breakers. This is only part of the total used by the entire industry.

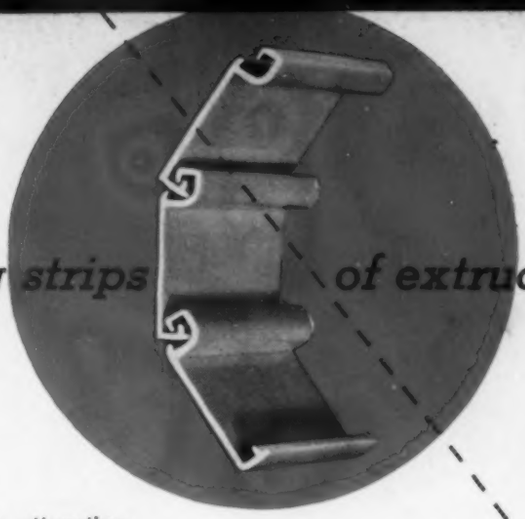
Figure 6 shows a single pole panelboard type ET circuit breaker in which the enclosing housing is made of a hot molded plastic, usually a phenol wood-flour composition. This and other types of molded case circuit-breaker require an insulating material which not only has mechanical strength but also has good electrical properties. General purpose phenol wood-flour compounds are the most commonly used for the cases. There are, however, certain parts which must be made of an impact material, such as phenol-rag for mechanical strength purposes, and other parts of phenol-asbestos where considerable heat is present.

Figure 7 shows the molded plastic parts used in the assembly of a 100-amp. frame, 3-pole, type ET interchangeable trip circuit-breaker manufactured by the I-T-E Circuit Breaker Company. For the standard commercial type of circuit-breaker, the base, cover, trip unit base, and trip unit cover are made of a phenol wood-flour composition. The handle, which probably receives the most abuse in service, is made of an impact phenol-rag compound. The tripper bar is made either of an impact phenol-rag compound or, if high temperatures are present, as they are in some cases, it is made of a phenol-asbestos compound.

Other insulators used

In the unit shown in Fig. 6, the arc suppressor hood is of a hard fiber or asbestos fiber material which must be formed to shape under heat. It is preferable to use an asbestos fiber material as this part is subjected to considerable heat and flame when the circuit-breaker opens under short-circuit conditions. In the large types of these molded case circuit-breakers, these hoods may be in several pieces and made of a laminated plastic post-formed to shape. Other insulation parts, such as barriers, are made of an electrical grade of fiber or laminated phenol-cloth.

(*Please turn to page* 178)



Interlocking strips of extruded Tenite

INTERLOCKING Tenite strips make attractive slide-away doors for kitchen cabinets. The lightweight panels glide up and out of the way at a touch, providing maximum entry to cupboards. Good dimensional stability of Tenite assures smooth operation.

Dust and grease are easily cleaned from lustrous Tenite surfaces with a damp cloth. Tenite color never needs refinishing, since it's peelproof. Tenite is extremely tough and can withstand hard use.

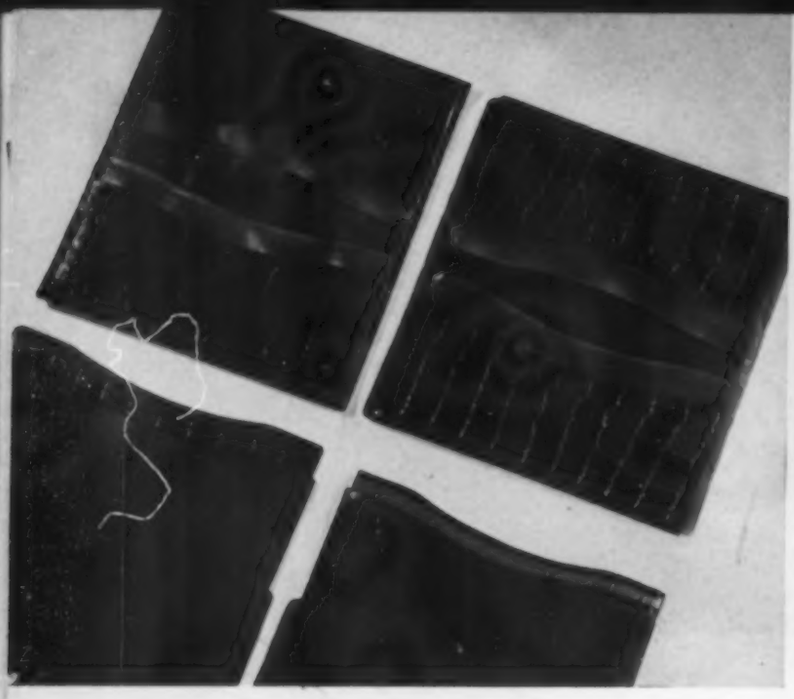
Tenite utility and beauty are featured in many other articles of household equipment—among them, telephones, toilet seats, kitchen utensils, bathroom fixtures, and nursery furniture. For other uses, and a complete picture of Tenite properties, send for a 32-page illustrated book on Tenite.
TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

● Information regarding Tenite is obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster, Mass., Los Angeles, New York, Portland, Ore., Rochester, N. Y., St. Louis, San Francisco, Seattle, and Toronto, Canada; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

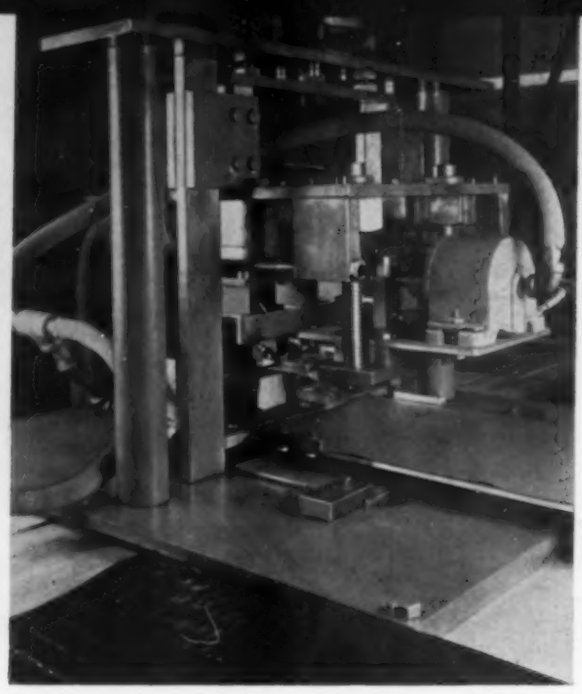
● Plastimode Interlocking Strips by Plastic Process Co., Los Angeles, as used in California "Sun Ranch" Homes by Cy Williams, Inc., Port Washington, N. Y.

TENITE

An Eastman Plastic



1—Four stages in manufacture shown: bottom right, end of lining folded over, sealed; bottom left, end of outside piece folded over, sealed; top right, ends of assembled wallet sealed; top left, sides folded, sealed



2—Two hundred wallets an hour can be accommodated on the edge-folding press above. This particular press is sealing the pocket edges of the heavier gage outside material

Welded Wallets

Die-cut polyvinyl chloride sheets are electronically sealed in high speed automatic presses

by ALVIN W. GELLERT*

IN THE luxury class in everything except price is a new men's plastic wallet which has no sewn or cemented seams. Secret of the quality and long life of the wallet (Fig. 1) lies in the use of embossed polyvinyl chloride sheeting and specially designed high-frequency sealing presses which eliminate the need for thread or cement in fabrication. The plastic material used in these wallets, known as Nulon, is supplied by Firestone or Bakelite in roll or sheet form, and is embossed in various simulated leather grains. Two diecut pieces of plastic comprise the complete wallet exclusive of the transparent identification cases. The finished dimensions of the opened wallet are 7 by 8 inches. The outside piece is made of 20-gage embossed sheeting and the inside piece or lining of 12 gage. The four pockets are formed automatically from the lining and outside pieces.

Edges sealed

In the first operation in the production of a wallet, the ends of each of the die-cut shapes are folded under for a distance of approximately ¼ in. and sealed, producing a neat, smooth, strong edge with an embossed line on the top surface. This forms the edge for each of the pockets. The formed outside and lining pieces are then accurately aligned with each other in a fixture which produces the pockets and permits sealing of the outside edges of both pairs of pockets simultaneously. The final operation consists of folding over and sealing both sides of the wallet. The entire process requires a total of seven automatic folding and sealing operations.

Some difficulties were originally encountered in making the final seals due to the variation in the number of layers along the length of the seal. Investigation proved that this problem could be completely eliminated by proper electrode design.

It was also found that unless properly designed the weakest points in the wallet are at the sides of the pockets. Any pulling on the pocket causes the plastic to be strained in shear at these points when a standard flat seal is used.

Since the resistance of the plastic material to a shearing force is not nearly so great as to a tension force, special electrodes were designed which did not produce a seal at those points on the flap in the final sealing operation immediately adjacent to the top edges of the pockets. This design relieved shear-

(*Please turn to page* 119)

*Chief engineer, International Electronics Laboratories, 630 Fifth Ave., New York 20, N. Y.

"Look! Here's a housing problem that's been solved..."

WHICH RADIO HAS THE RIGHT PLASTIC CABINET?

Like life in overcrowded quarters, inadequately housed radios are not satisfactory for long. Fortunately, a number of manufacturers have found that the right plastics provide radio housings that are handsome, durable, safe and efficient.

Best way to be sure that a radio cabinet *is* made of a plastic with the right characteristics is to check the informative label or leaflet that should be attached to it.

For example, if the housing of a radio—or an electric clock or shaver—is made of BEETLE* or MELMAC* plastics, the label or leaflet can tell you that ★ ★ ★ it has high electrical insulating properties and will not catch on fire ★ ★ ★ it is a thermosetting plastic and will not soften under exposure to heat ★ ★ ★ it is scratch-resistant (the rich colors of BEETLE or MELMAC plastics go all the way through from surface to surface, won't chip or peel off) ★ ★ ★ it is easy to keep clean and lustrous (does not attract dust and is not affected by common solvents such as alcohol or acetone).

Remember, *no one plastic serves all plastic needs.* So, look for informative labelling before you buy.

BE SURE *YOU* KNOW THE DIFFERENCE

Two plastic products may look exactly alike. The difference is that one is made of the right plastic, properly designed and applied. So, when buying, selling or making plastic products or parts, request information that will assure you they are soundly designed in the plastic best suited for the job.

QUESTIONS PLEASE! Our technical staff will be glad to help you solve problems in plastic application and design. And if our materials do not fill the bill exactly, we will cheerfully direct you to the right sources. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

Cyanamid
Plastics

DIVISION OF AMERICAN CYANAMID COMPANY

BEETLE* plastics—urea-formaldehyde thermosetting molding compounds. MELMAC* plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. URAC* resins—urea-formaldehyde thermosetting industrial resins and adhesives. MELURAC* resins—melamine-urea-formaldehyde thermosetting adhesive and laminating resins. LAMINAC* resins—thermosetting polyester resins.
*Reg. U. S. Pat. Off.

Eyes are on tableware molded of MELMAC*

You may already have seen the pleasing picture above. A few months ago, over the title "Set for a Lifetime," it appeared in an American Cyanamid Company advertisement in a group of consumer and general business magazines.† Since then interest in MELMAC tableware has been increasing . . . continuously and widely . . . among consumers, retailers and manufacturers.

And the same characteristics and properties that make MELMAC ideal for tableware . . . durability, color, lightness, rich appearance, ability to withstand hot water, strong soaps or detergents . . . have created a growing consumer and retailer demand for a widening range of items molded of this thermosetting compound.

MELMAC may well earn an important place in your plans, product and market. Why not investigate, with us, its potential for you.

Cyanamid Plastics

DIVISION OF AMERICAN CYANAMID COMPANY
32 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

*MELMAC is American Cyanamid Company's registered U. S. trade-mark for condensation products of aldehydes and amines.

†Saturday Evening Post, Newsweek, U. S. News, Business Week.

ing strains and produced a pocket with superior strength.

In addition to serving the functional purpose of the sealing operations, the electrodes produce an impression on both sides of each seal, of sufficient depth so that a neat bead is formed on all edges. This bead not only enhances the appearance of the finished product but provides also the desirable feature of a shaped edge for the gold corners to grip permanently.

Five presses used

In the production of these wallets, a total of five sealing presses are used, four of which were specially designed for the job. These are three edge-folding presses, one pocket-folding press which seals two edges simultaneously, and one standard small press for sealing the transparent identification-card holders.

The three edge-folding presses are essentially the same in mechanical operation. Figure 2 shows the edge-folding press for sealing the pocket edges; two such presses are used — one for the heavier gage material and one for the lighter gage. Figure 3 shows the edge-folding press for making the final sealing operation which closes the sides of the wallet.

The mechanical operations involved in folding and sealing are as follows: The work is placed in position on the press bed and two operating buttons are pressed, a procedure which has the safety feature of requiring both hands of the operator. The folding plate (4) then moves forward, actuated by air cylinder (6), while the upper press platen (7) moves down so that pressure plate (3) holds the work in position and the folding plate edge is at the folding line. This position of the platen is determined by an automatic stop. Folding bar (2) then moves up, lifting the edge of the material; upper electrode (5) moves forward, engaging the lifted edge of the material and carrying this edge across the folding plate, whereupon the folding plate retracts and permits the upper electrode to press the folded flap of material against the body of the wallet, thus completing the fold. At this stage the radio-frequency generator is automatically turned on to produce a seal. The press remains in this position for a predetermined length of time, returning to its original position automatically at the completion of the seal; the operator then releases the control buttons.

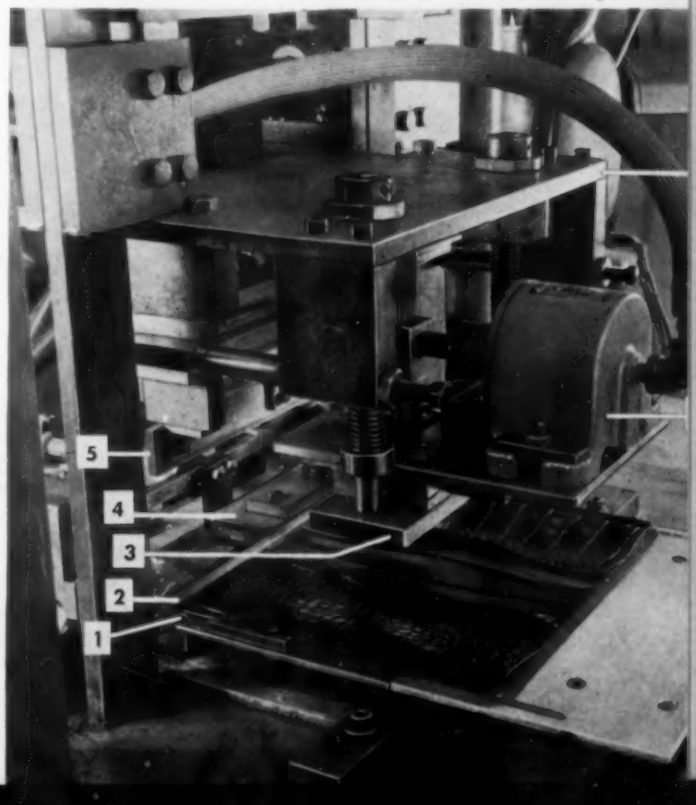
Air cylinders and solenoids

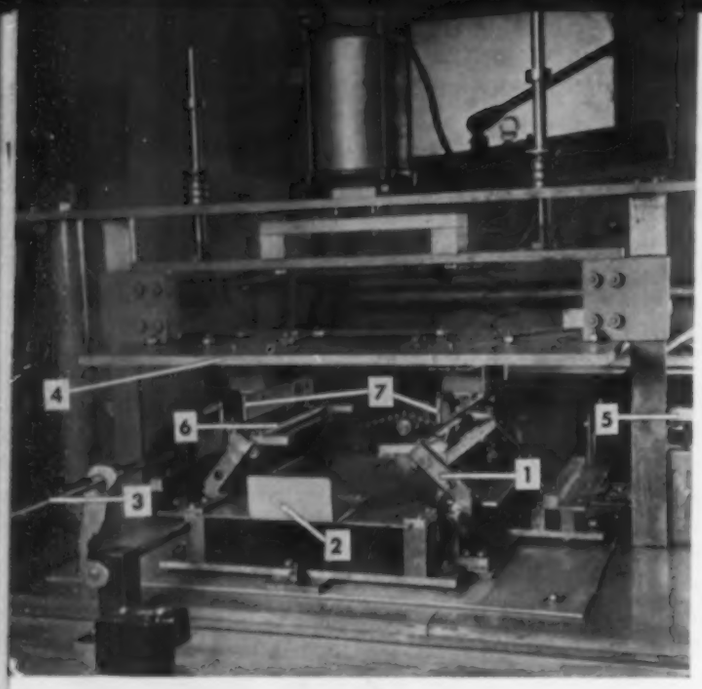
All the mechanical operations are performed with air cylinders except the automatic press stop which employs a solenoid. This automatic stop is used to prevent the upper press platen from lowering the upper electrode all the way until the folding pi has retracted. The four air cylinders used receive air pressure in the proper sequence by means of electrically operated air valves which are in turn controlled by a series of relays. These relays are connected so that the control buttons may be released at any time during the operation cycle, allowing the press to automatically reset itself. This prevents any of the moving members from colliding and makes for foolproof operation.

The press dwell at the time of sealing is controlled by an electric timer in the relay circuit. This timer is adjustable and permits setting to the optimum sealing time.

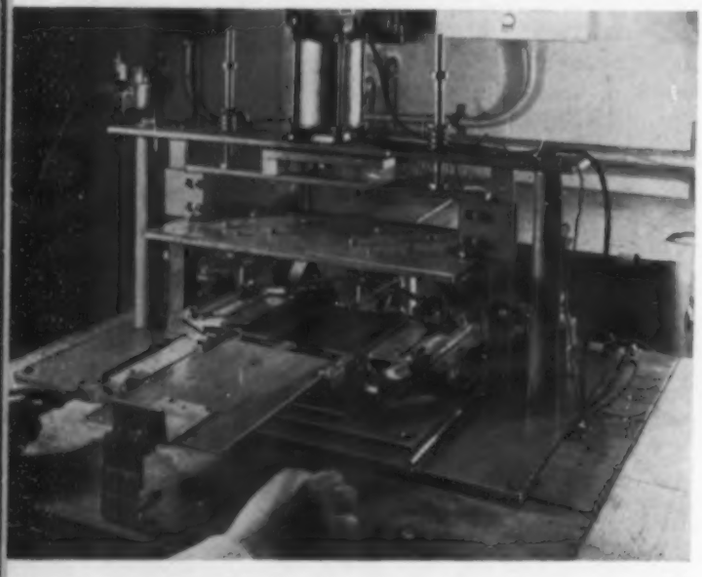
The pocket-folding press is shown in Figs. 4 and 5. This press differs essentially from the edge-folding presses in that the material is folded manually inside the press fixture and two seals are made simultaneously. The operations are performed in the following manner: With the folding arms (1), Fig. 4, open (as in Fig. 5), and the folding plate withdrawn, the 20-gage plastic is placed in position in the fixture, the 12-gage plastic is placed in its guide on top of this, and the folding plate (2) is pushed in. The clamping bars (6) are clipped into place and the folding handle is operated which brings both folding arms over simultaneously. When both arms are completely over and in contact with the upper surface of the folding plate, the operator presses the operating buttons (again with both hands) which causes the upper electrodes (7) to contact the folded edge of the plastic material. The radio-frequency generator is again automatically turned on for a predetermined length of time after which the press platen (4) raises a fraction of an inch and is held in place by the automatic stops (5). (*Turn to next page*)

3—Edge-folding press below performs the final sealing operation on the sides of the wallet. The various parts of the machine are as follows: 1) bottom electrode, 2) folding bar, 3) pressure plate for holding work in position, 5) upper electrode which carries edge of material across folding plate (4), 6) air cylinder, 7) upper press platen





—Pockets of 150 wallets can be folded an hour in this pocket-folding press which is shown in an open position above. Its various parts are as follows: 1) folding arm, 2) folding plate, 3) folding handle, 4) upper press platen, 5) automatic stop, 6) clamping bar, and 7) upper electrodes.



5—Pocket-folding press is shown in use above. It differs from the edge-folding press in that material is folded manually inside press and the two seals are made simultaneously

The hands may be removed from the buttons at this point in the cycle to withdraw the folding plate. When both operating buttons are pressed once again, the automatic stops (5) are actuated, permitting the press platen to descend the remaining distance and once again contact the plastic, whereupon the generator is again activated for the proper time period to complete the seal. The clamping bars are removed, the folding handle is swung back to its starting position, and the work removed.

The purpose of the folding plate is, first, to provide a fixed dimension for the two pocket folds, and second, to provide, by a unique design, a means for introducing slack in the heavier outside plastic piece so that no buckling of the inner lining occurs when the wallet is closed. This is accomplished by means of a tongue on the under-surface of the folding plate which forces only the outside plastic piece into a groove, thereby pulling more of this material between the seals. The purpose of the preliminary sealing is to prevent the sliding of the inner plastic piece when the fold plate is withdrawn immediately before the two seals are completed.

As in the edge-folding press, the pocket-folding press has its own automatic control system. One main air cylinder is used in this press and two solenoid-operated automatic stops, one on each side of the press platen. The folding arms are mechanically linked so that both operate in unison.

The final sealing operation is performed on a press similar to the edge-sealing press previously described. The only comment that can be made regarding this operation is that special electrodes are used which prevent sealing at the point of the pocket-edge folds.

200 megacycles

The radio-frequency generator was designed especially for the application, and produces approximately one kilowatt of power in the 200 megacycle region. Since none of the presses requires the full output of the generator, it was found entirely practical to connect two presses to one generator and use a system whereby the first press which was operated deactivated the second press until the original press cycle was completed. This did not seriously hamper the production rate yet it made economic use of the generators themselves.

The final operations for the completed wallet are the crimping on of the gold corners, which is done in a foot press, and polishing.

The highly automatic design features incorporated in the presses permit a completely unskilled operator to be fully trained in approximately 15 minutes.

Automatic operation proved

The quality of the seals runs very uniform and shrinkage is extremely small. A sampling of wallets is taken periodically for quality testing. All seals are cut through to expose a cross-section and determine the extent of material flow and homogeneity. Seals are also subjected to a tensile strength test.

In the use of this wallet making equipment it has been demonstrated that automatic units have a definite place in the plastic sealing industry and that they can, in a majority of cases, replace crude techniques and eliminate excessive material handling operations. Contrary to first expectations, maintenance costs have been extremely low on all the presses described.

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When Santicizers B-16, E-15 or M-17 are used in processing tubing, sheets and coatings this simple formula may be followed: resin plus plasticizer plus heat. The thorough plasticizing action of these Monsanto glycolates makes possible considerable savings in production costs, because it is not necessary to use additional solvents in the process.

Of equal importance is the lack of toxicity inherent in Santicizers B-16, E-15 and M-17. This characteristic makes them ideal for such applications as can and cap liners, hospital sheetings, acrylic dentures, beer and milk tubing. Other valuable qualities of these superior plasticizers are described under "Quick Facts."

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SANTICIZER E-15 ... An excellent plasticizer, particularly for nitrocellulose and cellulose acetate and for most resins. Light-fast and relatively non-volatile, even from the thinnest films. With both cellulose acetate and nitrate, gives clear, tough, flexible films with greatly increased resistance to moisture penetration.

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Photos Courtesy of American Cy...

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*PRODUCT NAME . . . Octa-Gane Water Injection Carburetor.

FUNCTION . . . Device regulates the amount of water which is inducted through the air horn of the gasoline carburetor into the combustion chamber, in combination with the fuel air mixture. Increases engine power output, decreases fuel consumption. Plastic Tank Size: 12" x 6".

MATERIAL . . . Melmac #3020 (product of American Cyanamid Company, New York) compounded with Claremont chopped Fabric Filler.

ADVANTAGES . . . High impact strength. Excellent heat resistance.

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TECHNICAL SECTION

Dielectric Fatigue of Plastics

by WILLIAM W. SHUSTER* and DAVID TELFAIR†

Dielectric fatigue tests were run on each of five plastic materials by subjecting the specimen to a constant voltage and measuring the time for breakdown to occur. The resulting breakdown voltage versus time curves resemble tensile strength versus time curves for long-time tensile tests. Standard short-time tests (A.S.T.M. D 149-40T) were also run for comparison with the fatigue results. The data obtained indicate that for a given thickness and conditioning a limiting voltage exists below which failure will not occur for an indefinite period of time. Roughly estimated limiting voltages are given for the five materials studied.

IT IS generally recognized that the standard tests for dielectric strength, while useful for comparative purposes, do not yield results which can be directly applied to the design of insulating components for electrical equipment. Although the test procedure described below does not overcome this limitation, it is believed that the results will be of greater value to the design engineer than will standard test results. It is conceivable that tests of the dielectric fatigue type, if carried out under a sufficiently great variety of conditions of preconditioning, specimen thickness, temperature, etc., would eventually yield data which could be used directly in design work.

In the meanwhile, the results reported below may be of some value in design work and at the same time serve as a reminder of the limitations of the standard tests for dielectric strength. Most of these limitations have already been pointed out in an appendix to the A.S.T.M. Standard on Electrical Insulating Materials.

Materials and test methods

The following five materials were tested: Cellulose acetate; polystyrene; Resinox 4216, a general purpose phenolic (wood-flour filler); Resinox 7934, a low power factor phenolic (mica filler); and Resinox 803, a high arc resistant melamine. All specimens were compression-molded disks, 4 in. in diameter. Thickness was held at 0.100 ± 0.005 in. except in the case of the polystyrene and the Resinox 7934. Because of the high dielectric strength of the latter two materials and the limited voltage range of the testing equipment used, thinner specimens were used for these materials.

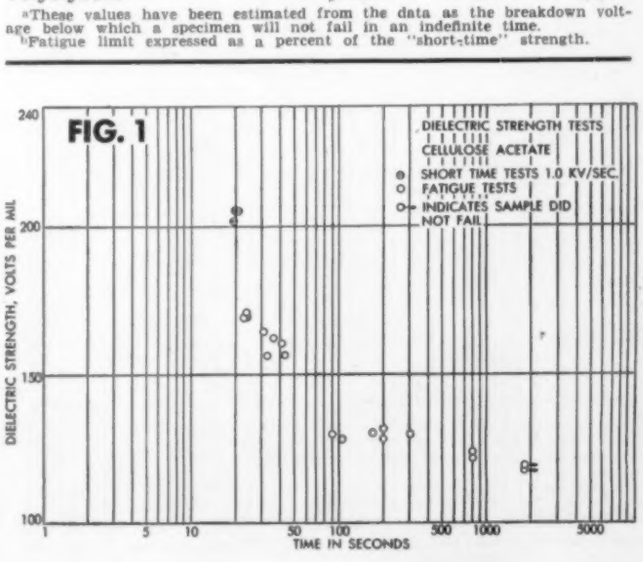
In order to simulate relatively severe conditions all specimens were conditioned for at least three days at 40° C. and 80% relative humidity. A saturated solution of ammonium chloride was used for regulating the relative humidity of the conditioning chamber.

Testing was done with oil-immersed electrodes of

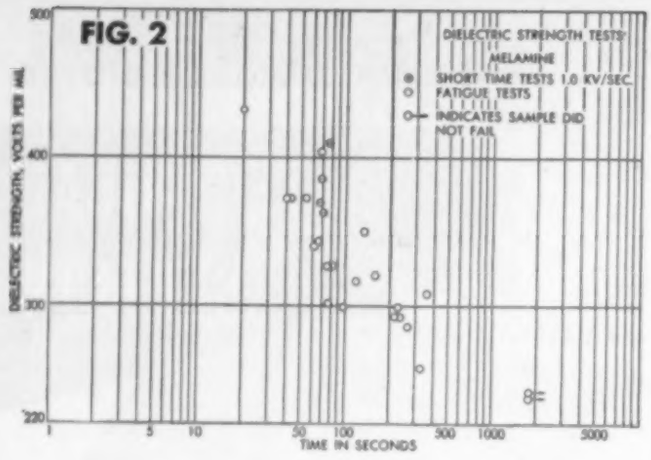
Table I.—Dielectric Strengths and Fatigue Strengths of Plastics

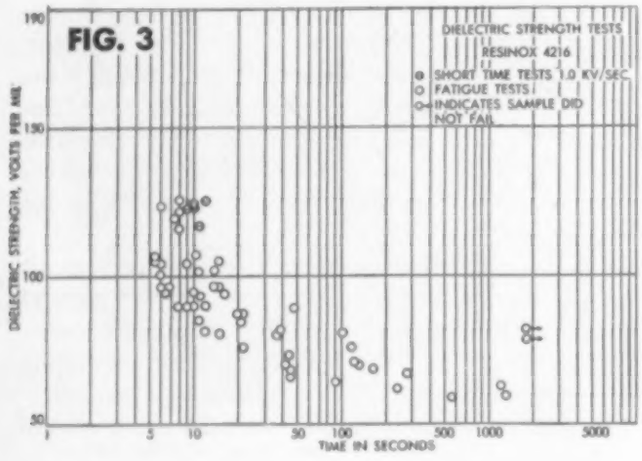
Sample	*Short time dielectric strength*	*Fatigue strength*[a]	*Fatigue limit*[b]
	v/mil	*v/mil*	*%*
Cellulose acetate	205	118	57
Melamine (Resinox 803)	400	240	60
Wood-flour-filled phenolic (Resinox 4216)	125	65	52
Mica-filled phenolic (Resinox 7934)	600	380	63
Polystyrene	>960	550	<57

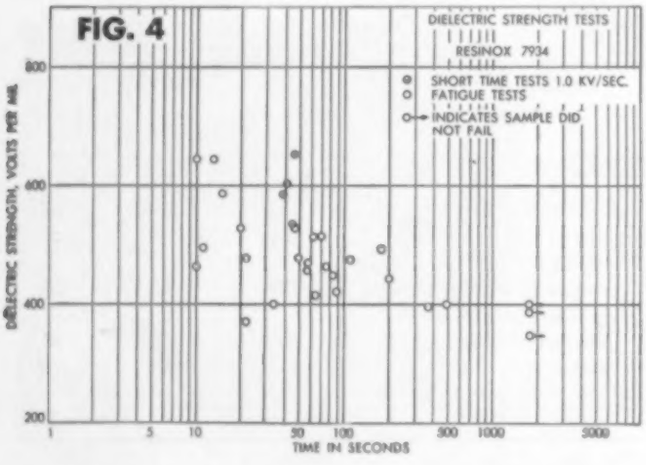
[a]These values have been estimated from the data as the breakdown voltage below which a specimen will not fail in an indefinite time.
[b]Fatigue limit expressed as a percent of the "short-time" strength.

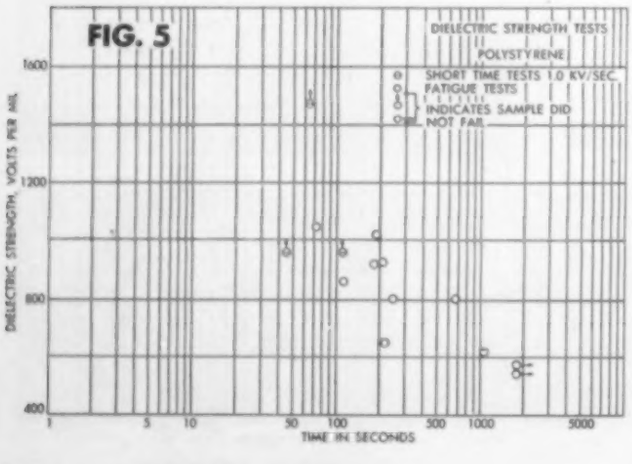


*Instructor of chemical engineering, Rensselaer Polytechnic Institute, Troy, N. Y.
†Assistant professor of physics and mathematics, Earlham College, Richmond, Ind. Formerly physicist, Plastics Div., Monsanto Chemical Co., Springfield, Mass.









the standard type. The capacity of the test equipment used was 50 kv.

Standard short-time tests were run in accordance with the procedure in A.S.T.M. method D 149-40T except for non-standard thickness and conditioning.

The fatigue tests were run as follows: The specimen to be tested was removed from the conditioning chamber and immediately placed between the electrodes of the testing equipment and immersed in the oil bath which was kept at 40° C. Voltage was applied at a rate of 3.0 kv./sec. until the desired voltage was attained. This voltage, which was some fraction of the short-time breakdown voltage, was maintained until the specimen failed. The voltage applied, the time required for failure to occur, and the thickness of the specimen in the immediate vicinity of the failure were recorded.

Results and discussion

The resulting data are presented in Figs. 1 through 6, and in Table I. Each of the materials initially show a rapid decrease in dielectric strength with time. However, after the initial rapid decrease, the dielectric strength tends to approach a constant value below which failure did not occur for an indefinite time. For the purpose of these tests 30 min. was considered to be an indefinite time period. This could be justified on the basis of the relatively small decrease in dielectric strength which occurred after 15 minutes. However, it is recognized that tests should be extended to much greater time periods before the test data could be used with assurance.

Table I gives a comparison between fatigue limit and the standard short-time dielectric strength. The fatigue limit estimated by the above method appears to be in the neighborhood of 55 or 60% of the standard short-time strength. This percentage may be somewhat lower than that corresponding to specimens conditioned at a lower relative humidity. On the other hand, tests carried out over a period of weeks or months would very probably show that the true fatigue limit had not yet been reached in 30

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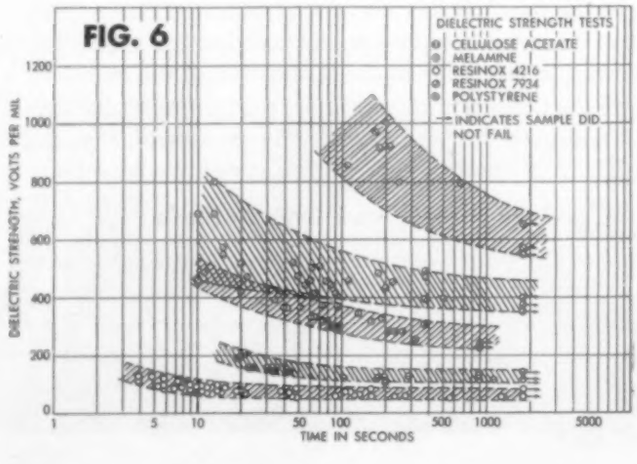

Polyamides in Germany: Intermediates*

THE development of polyamides, known in Germany as Perlon in the synthetic fiber field and as Igamid in plastics, has proceeded along rather different lines than that of the nylon resins in the United States and Great Britain. The main German effort was devoted to the polymer based on caprolactam rather than on the polymer made from hexamethylenediamine and adipic acid (called 66 polymer in the United States). The forecasted production schedule issued July 27, 1944, called for production of 330 tons per month of the caprolactam polymer (Igamid B) and 40 tons per month of the adipic-hexamethylenediamine polymer (Igamid A). By way of comparison, the scheduled production of the polyurethane made with 1,4-butanediol and 1,6-hexamethylenediisocyanate (Igamid U) was 5 tons per month.

The discovery and large scale development of the Reppe alkynol synthesis for the production of butadiene needed for the synthetic rubber program provided a source of many compounds of interest for fiber-forming polyamide polymers. One mol of acetylene combines with 1 mol of formaldehyde to produce propargyl alcohol, $CH \equiv C\text{-}CH_2OH$, and with 2 mols of formaldehyde to produce butyne-2-diol-1,4, $CH_2OH\text{-}C \equiv C\text{-}CH_2OH$. These two compounds can then be converted into intermediates for production of polyamides by steps outlined hereinafter and reported in detail in Publication Board reports.[1]

The plant capacity for making butynediol at Ludwigshafen was 80 tons per month and at Schkopau 12 tons per day. The Reppe alkynol synthesis provides a means for producing the commonly used intermediates at a lower potential cost than existing methods and for producing new intermediates which were hitherto inaccessible.

The compositions of the various types of polyamides which had reached a commercial stage of development in Germany and the production figures and costs are listed in Table I. Production of these nylon type resins and of the intermediates required in their manufacture was concentrated chiefly in the Ludwigshafen and Leuna plants of I. G. Farbenindustrie A.-G. The processes used to produce the raw materials for these resins are described herein.

Adipic acid

$HOOC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$

Adipic acid is made by nitric acid oxidation of cyclohexanol produced from phenol. The plant at Ludwigshafen-Oppau had a design capacity of 300 tons per month, but was never operated at more than 180 tons per month because the centrifuging and dry-

Table I.—Composition of I. G. Polyamides

Igamid type	*Composition*			*1942 production*	*cost*[a]
				tons	*RM/kg.*
(AH Salt)	Adipic acid		1 mol	631	3.61
	Hexamethylenediamine		1 mol		
A	AH Salt polymer			140	5.05
—	Caprolactam			914	3.60
B	Caprolactam polymer			515	4.45
6A	AH Salt	60%		912	4.73
	Caprolactam	40%			
5A	AH Salt	50%		38	4.85
	Caprolactam	50%			
(KH Salt)	Ketopimelic acid		1 mol	(Used only in	
	Hexamethylenediamine		1 mol	making Igamids 40B, 50B and 85B)	
40B[b]	Caprolactam	60%		0.2 (1940)	5.31
	KH Salt	40%			
50B	AH Salt	35%		.....	.....
	Caprolactam	40%		.....	.....
	KH Salt	25%		.....	.....
85B	Caprolactam	85%		3.1	4.65
	KH Salt	15%			
(AD Salt)	Adipic acid		1 mol	(Used only in	
	p,p'-Diaminodicyclohexylmethane		1 mol	making Igamids 1C and 50)	
1C	AH Salt	33-1/3%		.....	.....
	Caprolactam	33-1/3%		.....	.....
	AD Salt	33-1/3%		.....	.....
50	AH Salt	35 parts		.....	.....
	Caprolactam	40 parts		.....	.....
	AD Salt	25 parts		.....	.....
	Diethanolamine	4 parts		.....	.....

[a] The information presented in MODERN PLASTICS *23*, 152E (Oct. 1945) regarding the production volume and cost of the Ingamids is corrected in this table. The original data are given on pages 168 to 171 inclusive, of PB 949.

[b] PB 1341 indicates that the composition of this resin as made at Ludwigshafen was 36.22 parts AH salt, 38.00 parts caprolactam, 24.09 parts KH salt and 1.90 parts hexamethylenediamine succinate.

*This report is based on information contained in the following Publication Board reports:

PB 949, "Investigation of German plastics plants. Part I," by G. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love, and F. J. Curtis;

PB 1069, "Manufacture of thermoplastics in plants of I. G. Farbenindustrie A.-G.," by R. H. Boundy and R. L. Hasche;

PB 1341, "Summary of German lacquer resins, solvents and plasticizers," by G. M. Kline, MODERN PLASTICS *23*, 157 (Dec. 1945);

PB 1342, "Minutes of I. G. Organic Chemicals Conference of 9-22-43 in Frankfurt," translated by G. M. Kline and I. G. Callomon;

PB 2437, "Acetylene as the basis of a new industrial chemistry," by W. Reppe, translation by I. G. Callomon and G. M. Kline, MODERN PLASTICS *23*, 169 (Feb. 1946);

PB 7416, "Synthetic fiber developments in Germany," compiled and edited by L. H. Smith, published by Textile Research Institute, Inc., 0 E. 40th St., New York 16, N. Y. The investigating team was composed of F. S. Brown, R. Hill, G. P. Hoff, G. Loasby, J. B. Quig, J. J. Schilthuis, L. H. Smith, D. Traill, and D. B. Wicker;

PB 11407, "Igamid production in Ludwigshafen," by H. Hopff and H. Ufer (in German);

PB 11429, "Production of Igamids and their intermediates," by H. Hopff and H. Ufer (in German);

PB 12467, "German plastics practices," by J. M. DeBell, W. C. Goggin, and W. E. Gloor, published by DeBell and Richardson, Springfield, Mass.;

PB 25553, "Synthesis of intermediates for polyamides on an acetylene basis," by W. Reppe, translation by J. D. Rose.

PB 25642, "Investigation of German plastics plants. Part 2," by J. H. Rooney, G. M. Kline, J. W. C. Crawford, T. W. M. Pond, T. Love, and R. H. Richardson;

PB 28316, "Plastics in Germany, 1939-1945," by G. M. Kline, MODERN PLASTICS *23*, 152 (Oct. 1945);

PB 32266, "Polyamide films manufactured by Kalle and Co.; Supplement," by W. Wade;

PB 32548, "Polyamide films manufactured by Kalle & Co.," by W. Wade.

[1] See PB 2437 and PB 25553.

ing were under capacity. The essential feature of the process is to oxidize with 54% nitric acid at 65 to 70° C. in the absence of catalyst. Plant yields were 81 to 85.6% based on cyclohexanol and 1.5 kg. of nitric acid were consumed per 1 kg. of adipic acid produced.

The oxidizer charge is as follows:

1025 kg. cyclohexanol
2.5 cu. m. nitric acid (54%)
3.5 cu. m. mother liquor (54%)

Nitric acid and mother liquor are charged to the kettle and cyclohexanol added steadily as follows:

First hour: Add 500 kg., allowing temperature to rise and holding at 65 to 68° C.
Second hour: Add 375 kg. at 68° C.
Third hour: Add 150 kg. at 68 to 70° C.

The oxidation is exothermic and cooling is accomplished by internal coil and outer jacket. Nitrogen oxides are recovered to the extent of 300 kg. of the 1000 kg. of nitrogen oxides and nitrogen liberated. Thirty minutes after addition of the cyclohexanol has been completed, the reaction product is sucked to a vacuum cooler where it is cooled to 20° C. in 3 hr. by gradually reducing the pump pressure to 20 mm. The adipic acid slurry is centrifuged, yielding 1600 to 1700 kg., which is washed with 1600 kg. of cold water. The centrifuged mother liquor (4600 l.) and wash liquor are concentrated in a vacuum still to 3500 liters and recycled to the oxidation kettle. The crude adipic is dissolved at 80° C. in 3000 l. of wash liquors from the recrystallization operation and 1500 l. of fresh water. This requires 3 hours. The temperature of the solution is reduced to 20° C. in 2.5 hr. in a vacuum cooler. The suspended crystals are washed in a centrifuge with water until free from nitric acid. The crystals containing 9 to 10% water are dried in a rotary drier.

The Leuna plant with a capacity of 120 tons per month preferred to operate with 68% nitric acid at 40 to 45° C. using a manganese acetate catalyst. It was claimed that this gave a yield of 87.6% based on cyclohexanol.

Due to phenol shortage during the war, research was directed to alternate sources of adipic acid. Production from tetrahydrofuran is considered to have promising possibilities.[2] Hydrogenation of butyne-2-diol-1,4, obtained by the Reppe synthesis from acetylene and formaldehyde, yields 1,4-butanediol, which can be dehydrated to produce tetrahydrofuran. One mol of tetrahydrofuran is reacted with 2 mols of carbon monoxide and water, using 4 to 6% nickel carbonyl and 1% iodine as catalysts, at 270° C. and 200 atm. The hydriodic acid formed attacked stainless steel and so a platinum liner had to be used. The yield was 70 to 75% adipic acid with 20% valeric acid and 10% lactones.

Adipic acid can also be produced by adding vinyl methyl ketone to butadiene, hydrogenating the tetrahydroacetophenone to hexahydroacetophenone, and oxidizing the latter with nitric acid or air.

Another source of adipic acid is from cyclohexanol made from benzene via nitrobenzene and aniline. The aniline is hydrogenated and hydrolyzed with steam over a nickel-on-pumice catalyst. A 65% conversion to cyclohexanol is achieved; after separation, aniline, cyclohexylamine and dicyclohexylamine are recycled. A 98% yield of cyclohexanol based on aniline is claimed. A 400 ton per month plant was destroyed by bombing before coming into operation.

Air oxidation of cyclohexanol to cyclohexanone using silver catalyst, followed by air oxidation of the cyclohexanone in glacial acetic acid with manganese acetate as catalyst was investigated as a method of producing adipic acid, but was abandoned because of high cost and impurity of the product. It was stated that this is the method used by E. I. du Pont de Nemours & Co., Inc. in the United States.

Adiponitrile

$$NC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CN$$

A 30 ton per month plant was operated at Ludwigshafen to make adiponitrile, used as an intermediate in the manufacture of hexamethylenediamine. The process consists in passing adipic acid and ammonia in the vapor phase over a catalyst. Boron phosphate catalyst was preferred, but had been replaced during the war by phosphoric acid on precipitated silica. Research at Leuna indicated good results could be obtained with a 1:1 alumina/tungstic acid catalyst.

Adipic acid melted at 180° C. is fed at a rate of 120 kg. per hr. to a mixer and preheater. There it is mixed with ammonia which has been preheated to 420 to 450° C. The 20:1 mixture of ammonia and adipic acid at 320 to 350° C. passes to the catalyst chamber maintained at the same temperature. The reaction products go through a heat exchanger to a distilling column. Crude adiponitrile is removed at the bottom of the column and ammonia leaves at the top. The crude adiponitrile is refined in 16,000 l. batches in a vacuum still. Distillation is controlled by the setting point of the product, the main fraction being collected in the setting point range 1 to 2.4° C.

The phosphoric acid catalyst has a useful life of 4 to 5 weeks. The yield during the earlier stages is 80 to 82%, but this declines to 70%, at which point the spent catalyst is discarded and fresh charged.

Adiponitrile was also produced on a semi-commercial scale by treatment of adipic acid diamide with thionyl chloride or phosgene. An 85% yield was obtained in this manner.

The dichlorobutane method was also used to make adiponitrile. Tetrahydrofuran and hydrochloric acid in the presence of 50% sulfuric acid react to give a 95% yield of 1,4-dichlorobutane. This process has been worked in Ludwigshafen on a 5 ton per day scale; the dichlorobutane costs 0.65 RM/kg. with tetrahydrofuran at 0.60 RM/kg. The dichlorobutane is reacted with hydrogen cyanide in methanol solu-

(*Please turn to page* 172)

[2] See PB 25553 for further details.

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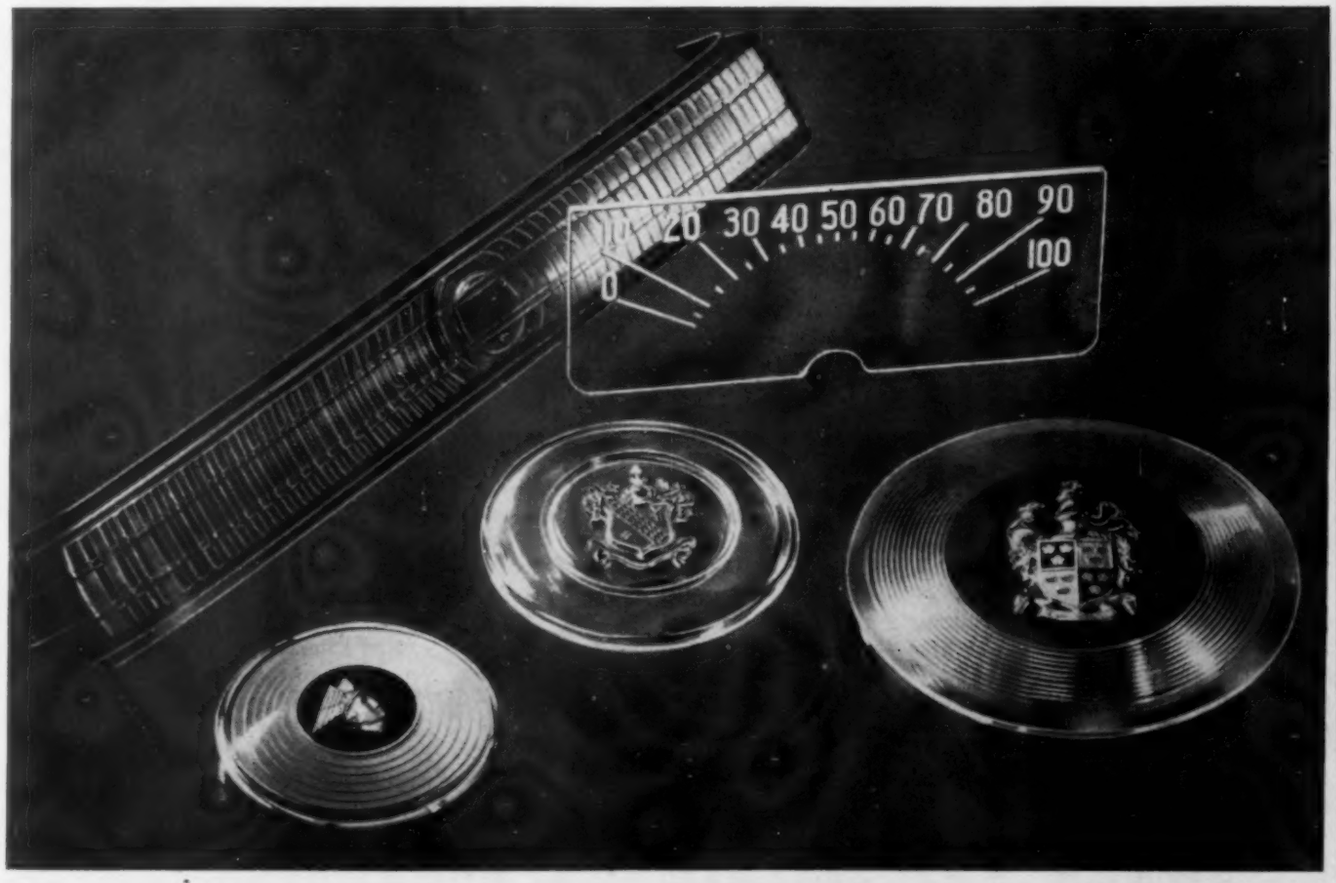

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General

WHAT'S HAPPENING WITH PLASTICS PRICES AND SUPPLIES. J. V. Sherman. Materials & Methods *25*, 79-83 (Apr. 1947). The problems involved in prices and supplies of plastics are discussed.

MODERN ALKYD RESIN PROCESSING EQUIPMENT. R. E. Nelson. Can. Chem. Process Ind. *31*, 210-13 (Mar. 1947). A plant for the synthesis of alkyd resins for coatings is described in this article.

LUBRICATION OF PLASTIC-BONDED FABRIC BEARINGS. A. H. Stuart. Plastics (London) *11*, 516-20 (Oct. 1947). The effects of various lubricants on resin-bonded fabric and paper, cast iron and steel bearings was investigated. The most suitable lubricant was a 1% aqueous solution of sodium oleate. The addition of colloidal graphite to the solution also produced certain advantages.

Materials

POLYSILOXANE ELASTOMERS. C. M. Doede and A. Panagross. Ind. Eng. Chem. *39*, 1372-5 (Nov. 1947). The silicone rubbers are polymers made by the condensation and oxidation of especially prepared methylsiloxane. They are flexible at —65° and remain stable at 200° C. These characteristics make them useful at temperatures below and above those at which the ordinary rubbers can function. Because these rubbers adhere readily to glass, it is possible to devise material constructions with some of the desirable properties of both substances. Their chemical resistance makes them desirable for gasket applications. The ease with which they adhere to steel makes possible the fabrication of high temperature rubber belting for the process industries. Other types of coated fabrics may serve as diaphragms or hot gas ducts. Still others, because of their excellent ozone resistance and ability to withstand corona cutting, have become desirable electrical insulating tapes. The fact that the rubbers are unplasticized and hence do not contain solvent-extractable materials promotes their use in systems where contaminants of the gasketing material should not exist.

POLYMETHYLSILOXANES . . . THERMAL AND OXIDATION STABILITIES. D. C. Atkins, C. M. Murphy and C. E. Saunders. Ind. Eng. Chem. *39*, 1395-1401 (Nov. 1947). The polymethylsiloxanes (or silicone fluids) are unusually stable to oxidation. No significant changes attributable to oxidation were observed at 175° C. At 200° C. oxidation occurs as revealed by viscosity changes and the evolution of formaldehyde and formic acid. The increase in viscosity of the fluids after oxidation is attributed to the condensation of two or more siloxane radicals from which methyl groups have been ruptured. The oxidation stability of the fluids decreases rapidly above 200° C., the maximum temperature at which they may advantageously be used in an oxidizing atmosphere. Copper, lead, and selenium inhibit the oxidation of the silicone fluids at 200° C.

Molding and fabricating

EMBEDDING SOFT TISSUES IN ACRYLIC. M. M. Strumia and J. I. Hershey. Canadian Plastics *5*, 21-2 (July 1947). The embedding of soft organic tissues in acrylic resin for preservation is described in detail. The principal problem is the preparation and dehydration of the tissues so that the most delicate cytological structures are preserved. The moisture is removed by freezing the specimens so that they are completely encased in ice and then subliming off the water vapor at low pressure, about 10 micra of mercury or less, at —40 to —50° C. The interstices are then filled with acrylic monomer by a vacuum technique. The specimen is placed on a base of acrylic plastic, and covered with successive layers of partially polymerized acrylic monomer until completely embedded. This is then polymerized at 45° C. to form a clear block of resin. The form and color of the tissue are unaffected.

PREHEATING WITH STEAM. C. G. Phillips. British Plastics *19*, 330-2 (Aug. 1947). Preheating phenolic molding powders in an atmosphere of water vapor is an economical and rapid method. It is suitable for many but not all applications. It is satisfactory for moldings for electrical purposes except where unusually high insulation is specified. The finish is improved where the type of mold is such that there is a good flow and mixing of the material, particularly in transfer molding, but in cases where there is little flow there is a tendency to show pellet marks.

Plasticizers

SYNTHETIC ELASTOMERS AS PLASTICIZERS FOR POLYVINYL RESINS. D. W. Young, R. G. Newberg, and R. M. Howlett. Ind. Eng Chem. *39*, 1446-52 (Nov. 1947). Addition of Perbunan 26 or Perbunan 35 to a vinyl chloride resin decreases the amount of ester type plasticizers necessary to obtain equivalent or better physical properties. The fugitive tendency of ester type plasticizers is reduced by addition of small amounts of rubberlike 1,3-butadiene-acrylonitrile copolymers. The Perbunan 35NS vinyl resin VYNW dioctyl phthalate blends have good oil resistance. Other advantages which Perbunan 26NS or Perbunan 35NS impart to a VYNW plastic compound are improved elongation and low temperature properties as evaluated by brittle tests.

Applications

PLASTICS—THEIR GROWING USE IN TELEPHONE PLANT. J. R. Townsend. Bell Telephone Mag. *26*, 127-35 (Autumn 1947). The properties, methods of molding and specific applications of some of the types of plastics used in manufacturing telephone equipment are reviewed in an elementary, relatively non-technical manner.

COPYING NATURAL HORN IN BUTTON MAKING. Plastics (London) *11*, 404-6 (Aug. 1947). The molding of buttons from a urea-formaldehyde hornmeal compound is described. These buttons resemble natural horn in appearance. The technique for producing the mottled appearance consists of placing the various colored

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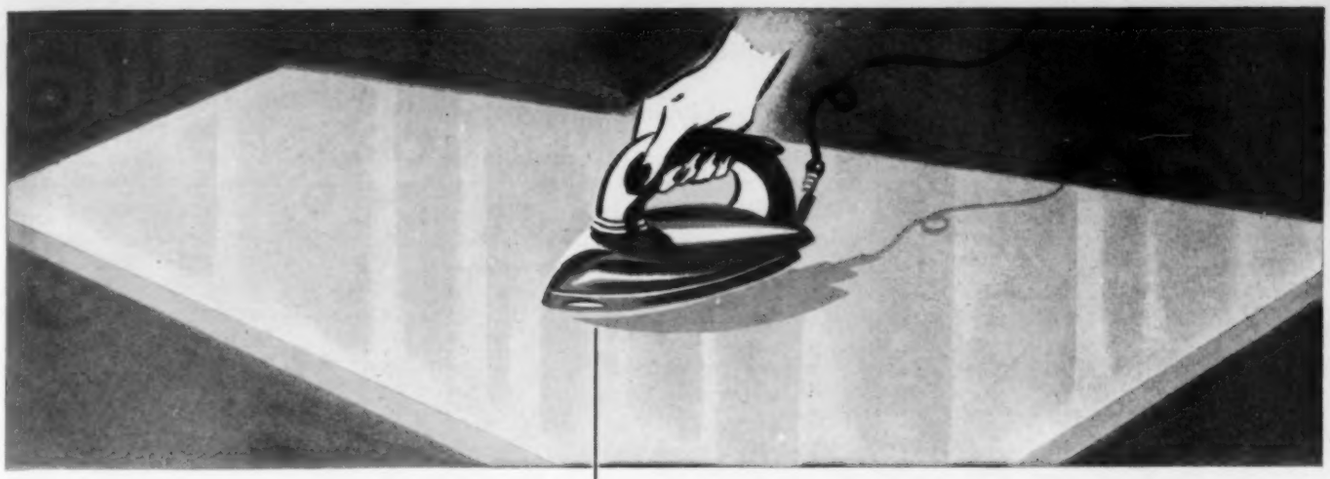

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and transparent materials in the molds with stencils and filling impressions made in the layers of molding powder prior to applying heat and pressure.

Coatings

PROTECTING SURFACE FINISH WITH STRIPPABLE PLASTIC COATINGS. H. R. Clauser. Materials & Methods *26*, 70-4 (July 1947). The properties of the various commercially-available strippable plastic coatings are described.

NOMOGRAPH FOR PAINT FILM CALCULATIONS. H. A. Berman. Ind. Eng. Chem. Anal. Ed. *19*, 915-18 (Nov. 1947). A nomograph is described for the calculation of wet film thickness, spreading rate, and dry film thickness, spreading rate, and dry film thickness of paint and varnish coatings from the weight of such films on panels. Testing techniques used to obtain the necessary experimental data for these calculations are given.

Properties

CHEMICAL RESISTANCE OF PHENOLIC LAMINATES. W. R. Tyrie. Trans. A.S.M.E. *69*, 795-7 (Oct. 1947). Eight representative types of phenolic laminates were immersed in various aqueous chemical solutions for six months and tested periodically for weight change, dimensional change, and strength losses. Any phenolic laminate which has the desired properties after prolonged immersion in water alone can be expected to be satisfactory for field conditions involving weak acid, weak oxidizing agents, and such conditions as are to be found in the rayon-spinning industry. For these applications, the general order of chemical resistance, reading best to worst, is a follows: G1 and G3, AA, LE, CE, C, XXX, and XX (NEMA and ASTM Grade Designations). Where alkaline field conditions are involved, the cotton-fabric-base laminates can be expected to offer the best resistance. Within this group, the laminates which have been processed for electrical properties can be expected to have the best resistance. When strongly acid conditions are involved, all types of phenolic laminates can be expected to show serious strength losses. These losses are on the order of 30 to 40% for glass-base laminates and over 50% for all other grades. When selecting a material for use where a strongly acid condition is involved, a laminated material should be used only when thorough investigation has shown that it has some important advantage over other types of material.

Chemistry

THE INFLUNCE OF pH ON THE SETTING OF PHENOLIC RESINS. G. E. Little and K. W. Pepper. British Plastics *19*, 430-6 (Oct. 1947). Experiments carried out with phenol indicate that the initial pH of the resin must be brought to about unity for setting to occur. Varying the method of preparation of the resins has no effect other than that lightly condensed resins set at a lower pH. While resins based on ortho substituted phenols set at pHs comparable with those shown by resins based on phenol, meta substituted phenols yield products setting at higher pHs, but with increased sensitivity to hardener concentration. Satisfactory resin setting at room temperature under neutral or mildly acidic conditions cannot be prepared directly from monohydric phenols. The dihydric and trihydric phenols examined yield resins setting at low pHs by a hydrogen ion catalyzed reaction, polyhydric phenols having a 1 : 3 structure, yield resins which will set at neutrality.

NOVOLAKS. M. Koebner. British Plastics *19*, 348-51 (Aug. 1947). The reactions of phenol and the cresols with formaldehyde in the presence of different catalysts to form novolaks were investigated in detail.

Testing

BURST TEST APPARATUS FOR RUBBER AND SYNTHETICS. A Bryant. ASTM Bulletin *1947*, 64-8 (Oct. 1947). The burst test consists essentially of the bursting of test specimens by means of air pressure. Two test methods are employed: the instantaneous burst, which is comparable to a tension test, and the time burst, which is comparable to a long-time tension or creep test. The burst test affords a very convenient method of measuring the strength of rubber and synthetic compounds. It is especially adaptable to measuring the effects of aging and measuring the strength at elevated temperatures. There does not appear to be a very close correlation between bursting strength and tensile strength. However, it is felt that for many purposes the burst test is more significant than the tension test. The burst test is limited in that it does not give any results comparable to the stress-strain relationship or to the ultimate elongation, nor does it afford any means of measuring tear resistance. The time burst, however, gives a significant result which isn't easily obtained any other way.

INVESTIGATION OF THE RESISTANCE TO IMPACT LOADING OF PLASTICS. H. Liander, C. Schaub, and A. Asplund. ASTM Bulletin *1947*, 88-94 (Oct. 1947). The commonly used method for determining the impact strength of plastics by means of the impact pendulum, using the single blow method, gives an incorrect value if no notice is taken of the kinetic energy of the fractured pieces and of other losses. As the result is, in any case, referred to the cross-sectional area of the test specimen it only gives comparative values applicable to certain sectional dimensions and fixed conditions of test. By employing the increasing-blow method with a falling-weight machine or a pendulum and by referring to the total loaded volume of the test specimens the impact flexural strength and the impact resistance value obtained thus will give a true measure of the qualities of the material concerned. The test values obtained in this manner were found to be independent of the dimensions of the test specimen, taking into consideration the effect of shear stresses and deformation of the point of contact in short test specimens.

DEMONSTRATION OF SOME NEW METHODS OF DETERMINING MOLECULAR WEIGHTS FROM THE DATA OF AN ULTRACENTRIFUGE. W. J. Archibald. J. Phys. & Colloid Chem. *51*, 1204-14 (Sept. 1947). Methods for determining molecular weights of high molecular weight materials from the data obtained with the ultracentrifuge are described in this article.

Synthetic Rubber

BEHAVIOR OF SILASTIC ON AGING. G. M. Konkle, R. R. Selfridge and P. C. Servais. Ind. Eng. Chem. *39*, 1410-13 (Nov. 1947). Silicone rubbers possess combined resistance to a wide variety of conditions which normally cause deterioration in organic elastomers. Under some of these conditions, such as exposure to heat, silicone rubber is serviceable at temperatures considerably above that of any other natural or synthetic rubber formulation. Moreover, these tests give further support to the hypothesis that stability is inherent in the silicone polymer because resistance to one set of conditions is not developed by special formulation at the expense of resistance to other kinds of aging. Both high and low temperature stability, together with weather and oil resistance, are found to be characteristic of silicone elastomers.

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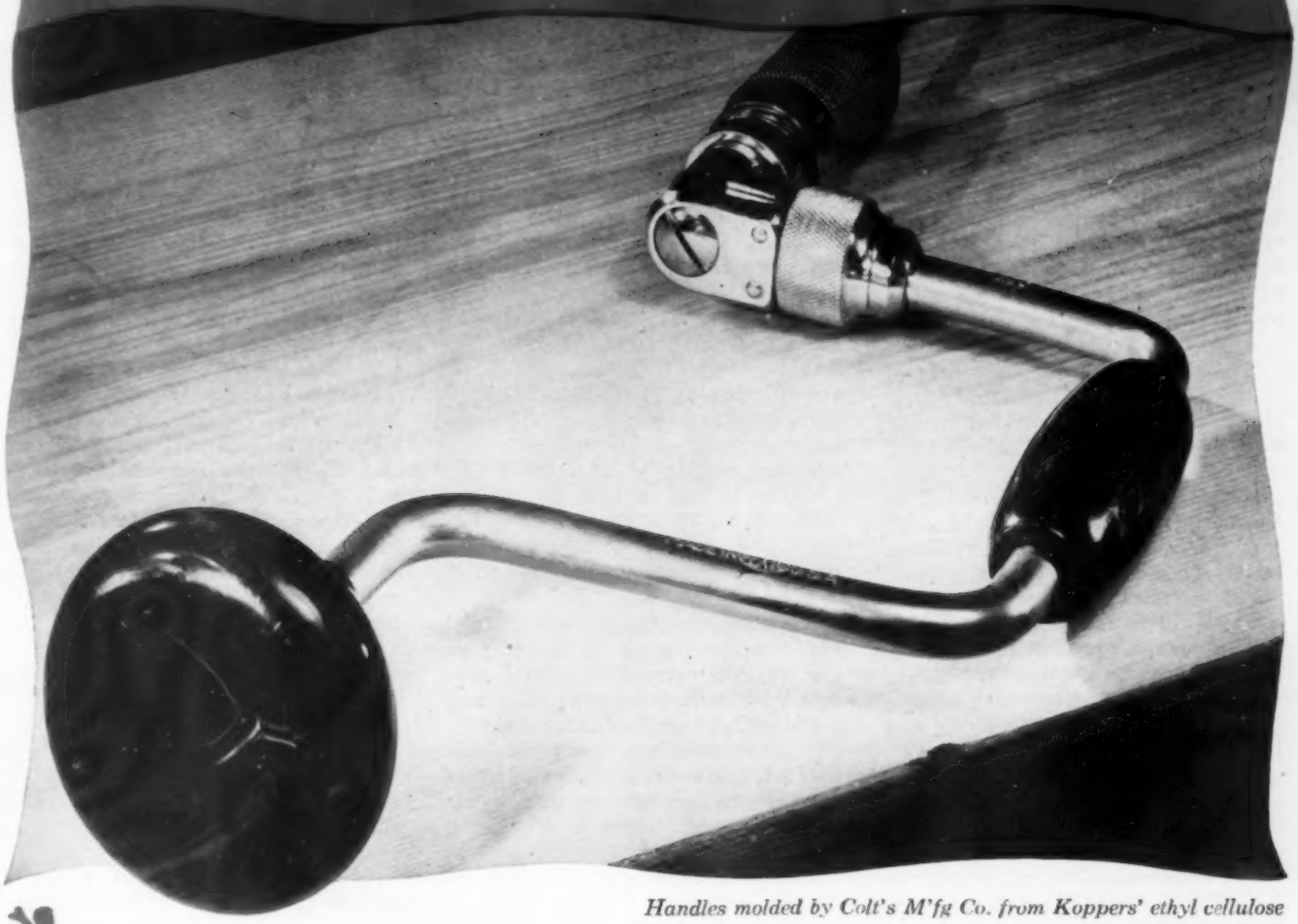

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When plastics have work to do . . . a tough day-after-day assignment . . . more and more manufacturers are calling on the cellulosic plastics to *handle* the job. That's why this Peck, Stow & Wilcox carpenter's brace and many other tools now have handles of ethyl cellulose.

Handles of ethyl cellulose *stay* on the job . . . remain tough and resilient at low temperatures...resist moisture and heat. They are handles that hard knocks won't shatter, that can be quickly produced by extrusion or injection molding, and can be readily machined.

For detailed information on the unusual *combination* of properties provided by the cellulosics, and the Hercules base materials from which these thermoplastics are made, write to:

HERCULES POWDER COMPANY *916 Market St., Wilmington 99, Del.*
INCORPORATED

Ethyl cellulose gives Western Electric's new Hearing Aids thin-wall toughness, dimensional stability

New, flame-resistant cellulose acetate housings for A. C. Gilbert Whirlbeater mean added safety in service; lightweight toughness

Cellulose acetate was chosen by Fuller Brush Company because of its toughness, impact strength, and eye-appeal

CP6-6

Save and Sell with Cellulosic Plastics

CELLULOSE ACETATE • ETHYL CELLULOSE • NITROCELLULOSE

U.S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each

FABRIC COATING. J. H. McGill and L. B. Morgan (to Imperial Chemical Industries, Ltd.). U. S. 2,428,716, Oct. 7. Coated fabrics are prepared by applying to a textile base fabric, a composition containing an aqueous emulsion of polyvinyl chloride and a plasticizing agent.

WEATHER STRIPPING. G. Abrams, U. S. 2,428,731, Oct. 7. Weather stripping comprising an extruded elongated channel of plastic material.

UREA-FORMALDEHYDE RESINS. P. S. Hewett (to Reichhold Chemicals, Inc.). U. S. 2,428,752, Oct. 7. A clear, water-soluble, stable resin is prepared by heat-reacting urea and aqueous formaldehyde in the molar ratio of one part urea to 2 to 2.5 parts formaldehyde in a two-step process, the first step being carried out at a pH of 6.7 to 7.3 in the presence of a buffer comprising a mixture of borax and boric acid, and in the second step adding boric acid.

SHEET GASKET MATERIAL. R. Almy (to Armstrong Cork Co.). U. S. 2,428,771, Oct. 14. Sheet gasket material is prepared by mixing inorganic fibers with an aqueous dispersion of heat-curable binder material, evaporating all water from the mixture to form a dry crumbly mix, adding a tack-creating solvent for the binder, calendering the mix into a sheet, pressing at elevated temperature to smooth the surface and finally curing the binder.

INTERPOLYMERS. G. F. D'Alelio (to General Electric Co.). U. S. 2,248,-787—8, Oct. 14. The polymerization product of a mixture comprising a polymerizable unsaturated alkyd resin obtained by esterification of a polyhydric alcohol, an alpha-unsaturated α,β-polycarboxylic acid and a saturated aliphatic or aromatic carboxylic acid, and a polyallyl ester of a saturated aliphatic polycarboxylic acid.

FLAME-RESISTANT TEXTILE. L. W. Georges and C. Hamalainen (to United States of America.). U. S. 2,428,843, Oct. 14. Flame-resistant fibrous cellulosic material comprising an anhydrous vegetable fibrous cellulosic material with a hot solution of 2,4,6-trichlorophenyl isocyanate in pyridine.

MOLDING MACHINE. A. H. Johnson (one-half to F. T. Johnson). U. S. 2,428,878, Oct. 14. A machine for molding plastic or glass objects.

DECORATIVE ARTICLES. J. R. Mares (to Monsanto Chemical Co.). U. S. 2,428,977, Oct. 14. Decorative articles are produced from thermosetting casting syrups by casting a preliminary section, congealing said section by cooling to at least 0° C. while it is still fusible, positioning said section in a mold, filling the mold with additional thermosetting resin syrup of a contrasting color.

NITRILE COPOLYMERS. J. D. D'Ianni (to Wingfoot Corp.). U. S. 2,429,018, Oct. 14. Polymerized material is prepared by converting part of a material such as acrylonitrile, an alpha-alkyl acryonitrile, or an alpha-halo acrylonitrile to an acrylate and heating the reaction mixture until it has copolymerized.

POLYMERIZATION. W. R. Hoover, R. M. Paulsen, and S. V. Landgraf (to U. S. Rubber Co.). U. S. 2,429,-060, Oct. 14. A 100% polymerizable low pressure impregnating resinous material comprising a liquid dihydric alcohol ester of an ethylene α,β-dicarboxylic acid and a liquid monomeric unsaturated polymerizable compound.

COMPOSITE FELT. G. M. Rickus, S. G. Hoffman, and B. H. Archer (to Hat Corp. of America). U. S. 2,429,-073, Oct. 14. In the making of a dyed felt hat, adding combed cotton fibers treated with an aqueous solution of melamine, hydrochloric acid, formaldehyde, and a softener.

LIGNIN ESTERS. H. F. Lewis and F. E. Brauns (to Mead Corp.). U. S. 2,429,102, Oct. 14. New resinous products adapted for use as mold lubricants and the like comprising monobasic aliphatic carboxylic acid esters of the lignin material.

VINYLIDENE CHLORIDE. R. F. Boyer (to Dow Chemical Co.). U. S. 2,429,-155, Oct. 14. A composition comprising a polymeric vinylidene chloride and as light stabilizing agents 2,2'-dihydroxybenzophenone and from 1 to 5% of xenyl salicylate.

VINYLIDENE CHLORIDE. L. A Matheson and R. F. Boyer (to Dow Chemical Co.). U. S. 2,429,165, Oct. 14. A composition comprising a polymeric vinylidene chloride and as a stabilizer an alkyl ester of an acyl citric acid.

SHAPED PROTEIN. G. F. Biehn and E. T. Cline (to E. I. du Pont de Nemours & Co., Inc.) U. S. 2,429,214, Oct. 21. Prolamine synthetic fibers are prepared by extruding an aqueous alkaline prolamine solution into an aqueous coagulating bath containing formaldehyde, a strong mineral acid, and a water-soluble inorganic salt.

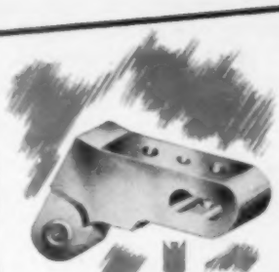
SUPERPOLYESTERS. J. C. Cowan and D. H. Wheeler (to U. S.). U. S. 2,429,-219, Oct. 21. An essentially linear superpolyester is prepared by reacting a dihydric alcohol with a dimeric dibasic fat acid or an ester thereof.

STRUCTURAL SHEET. R. E. Miskelly and R. L. Drew (to Plymouth Cordage Co.). U. S. 2,429,235, Oct. 21. A stiff structural sheet comprising a plurality of fibrous laminae and a binding medium for said fibers.

REDWOOD PLASTIC. E. Reineck and I. R. Dunlap (to Institute of Paper Chemistry). U. S. 2,429,329, Oct. 21. A molding powder comprising 80 parts of steam-disintegrated redwood pulp 20 parts of furfuryl alcohol-formaldehyde resin, two parts boric acid, two parts lignin stearate mold lubricant, two parts paraformaldehyde, and one part carbon black.

RIGID SHAPES. J. Bailey (to Plax Corp.) U. S. 2,429,340, Oct. 21. A rigid integral and non-lamellar shape of molecularly oriented polymer is prepared by processing layers of molecularly oriented polymer sheet on a rigid mold member of the approximate shape desired.

SHOE. N. R. Glass U. S. 2,429,354, Oct. 21. A plastic sole, upper and insole.



...because of these **BUTTS**

there are no "IFS" in Pratt, Read & Co.'s

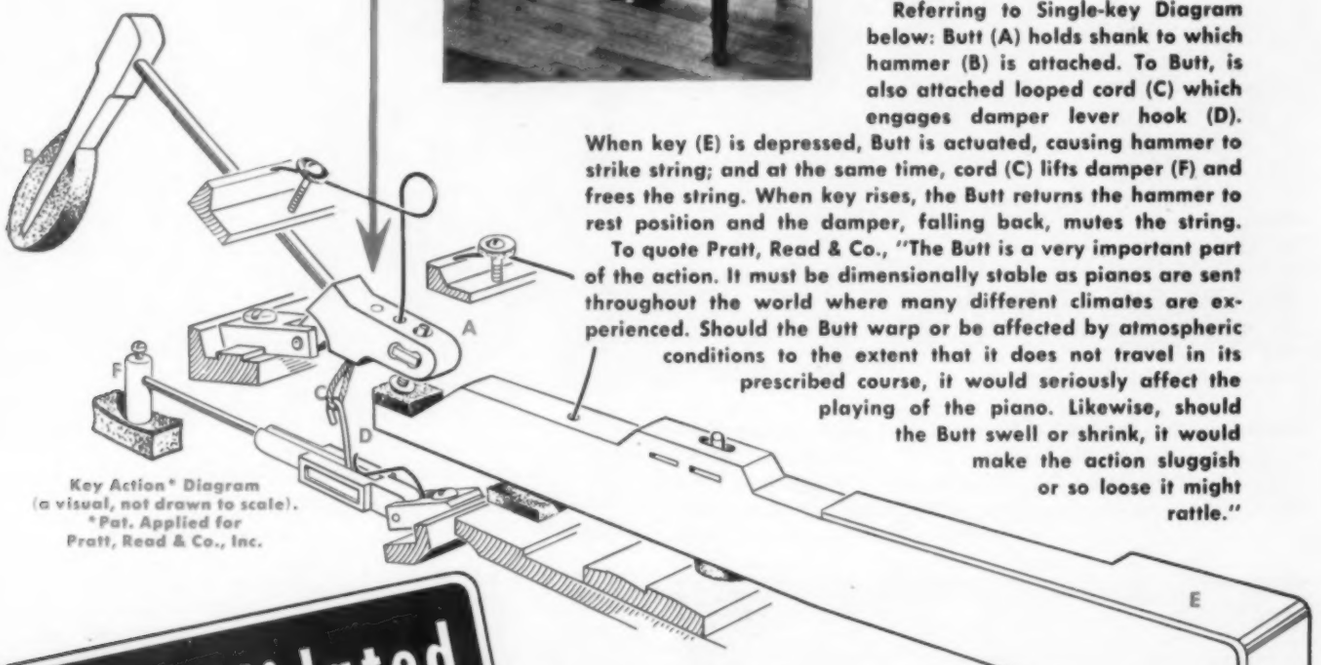
New 64-Note Piano Action!

To Right: Model K (64-Note) Piano, product of Pratt, Read & Co., Inc. Ivoryton, Connecticut

These Butts are plastic pieces . . . carefully engineered — precision molded. Perfection duplicates (64 per action), each exactly alike . . . and all functioning integrally as parts of an unique 64-note piano keyboard!

Referring to Single-key Diagram below: Butt (A) holds shank to which hammer (B) is attached. To Butt, is also attached looped cord (C) which engages damper lever hook (D). When key (E) is depressed, Butt is actuated, causing hammer to strike string; and at the same time, cord (C) lifts damper (F) and frees the string. When key rises, the Butt returns the hammer to rest position and the damper, falling back, mutes the string.

To quote Pratt, Read & Co., "The Butt is a very important part of the action. It must be dimensionally stable as pianos are sent throughout the world where many different climates are experienced. Should the Butt warp or be affected by atmospheric conditions to the extent that it does not travel in its prescribed course, it would seriously affect the playing of the piano. Likewise, should the Butt swell or shrink, it would make the action sluggish or so loose it might rattle."



Key Action* Diagram (a visual, not drawn to scale). *Pat. Applied for Pratt, Read & Co., Inc.

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NEW MACHINERY AND EQUIPMENT

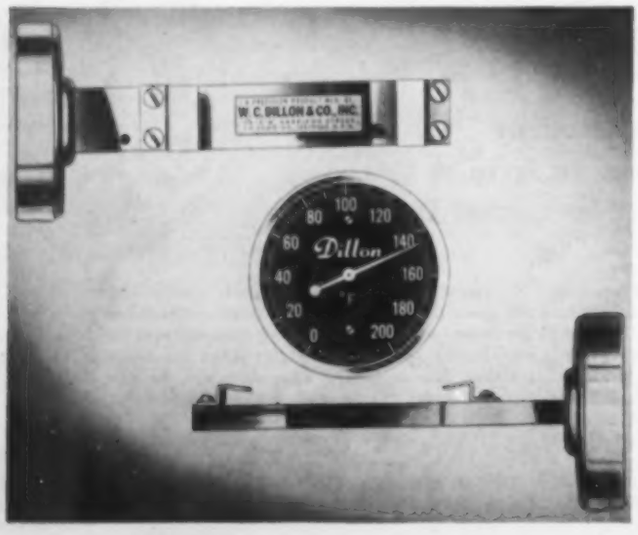
Barrel tumbler—A portable barrel tumbling machine for mixing plastic powders and pigments, and for burr removal, has been announced by the Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland, Ohio. Infrared heat lamps may be directed into the top of the drum to facilitate drying of powders during the mixing operation. The unit accommodates barrels or drums from 21 to 27 in. in diameter. Smaller barrels may be tumbled by placing them inside larger barrels. The roller is driven by a chain drive adjustable for take-up.

Hand drill—Air-Speed Tool Co., 1500 W. Slauson Ave., Los Angeles, Calif., has added a straight type and pistol grip hand drill to its line of air-powered hand tools. Both types are designed to operate efficiently at air pressure of 90 to 100 pounds. Air consumption is estimated at 12 cubic ft. per min. at drill speeds of 14,000 r.p.m. Features include controllable speed regulation, light weight, high speed, and cool operation.

Jig saw and tilting table saw—Two new machines, a 24-in. four-speed jig saw and a tilting table saw, have been placed in production by the Walker-Turner Co., Plainfield, N. J. A patented tensioner on the jig saw allows rapid blade changes and permits tension adjustment when the machine is in motion. Air pressure is kept constant at all speeds by a new blower. The saw guide is adjustable to all thicknesses of material and the table, which tilts to 45°, is 16 by 12¾ inches.

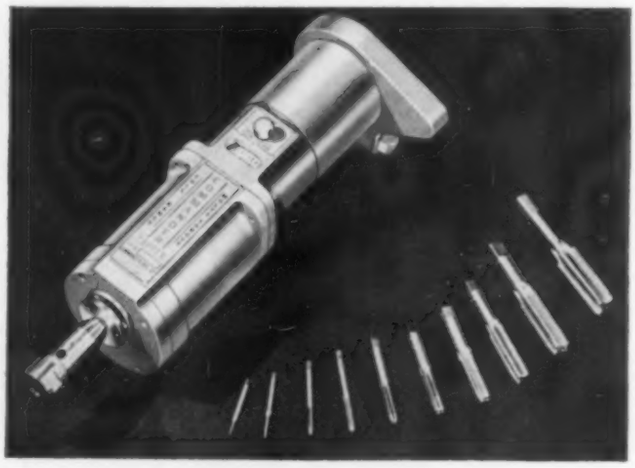
The tilting table saw may be used with an 8-in. blade and ½ hp. motor or a 9-in. blade and a 1 hp. motor. Table is 20¼ by 15 inches.

Dial-type thermometer—For clamping onto flat or rectangular surfaces, W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill., has developed the Dillon Flat Stem dial-type thermometer. With this flat stem design, the heat element fits snugly against the object under test and presents a wide heat absorbing area. The thermometer can be supplied in flat stems of varying widths, thicknesses, and lengths, and in the following capacities: 0-200° F., 50-500° F., 150-750° F., and 200-1000° F.



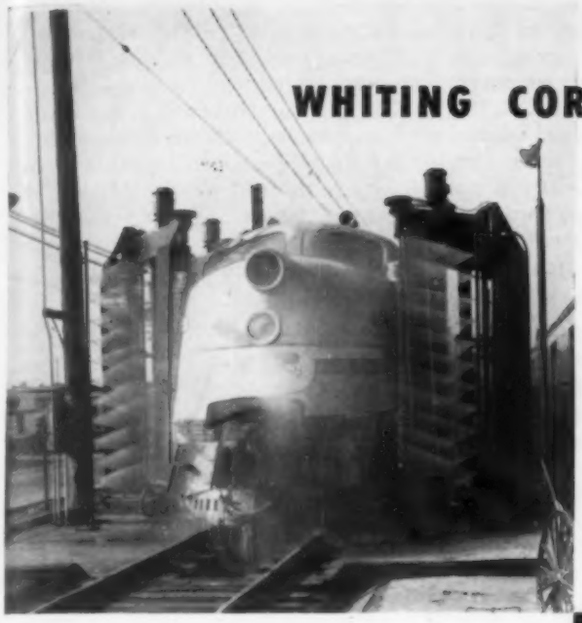
Drill—Enesay Tool Co., Inc., 756 S. Broadway, Los Angeles, Calif., has announced a drill which can be used successfully on phenol-formaldehyde, melamine-formaldehyde, urea-formaldehyde, polystyrene, acrylic, cellulose acetate, and steel alloys hardened to 68 Rockwell "C". Manufacturing tolerances are +0.0001 −0.0000 in., and the tensile strength is over 45,000 p.s.i. On a ½ by 4-in. phenolic test block, a 7/32-in. drill operating at 2200 r.p.m. drilled 115 holes in rapid succession with no wear on drill and no sharpening required at end of test. This drill is available in all standard sizes.

Multi-purpose tapping head—A new tapping head which will handle taps from #0 to ¾ in. and fit any drill press has been announced by the Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill. Suited for cycle tapping and outside diameter threading as well as routing machine tapping, the tapper features a patented spring clutch drive and an adjustable torque control. This drive is said to eliminate the slippage and wear caused by misadjustment and misuse common in conventional type tappers.



Milling machine—Model 0-16A, a ram type, hand feed vertical milling machine available with either swivel head or universal head has been announced by the George Gorton Machine Co., Racine, Wis. This machine replaces the 8-D fixed head vertical model and has an adjustable ram, heavy column, sensitive table, and saddle movements. It is recommended for use in toolrooms, die-mold shops, and for production milling on small parts.

Package steam generators—Foster Wheeler Corp., 165 Broadway, New York 6, N. Y., is now offering "packaged" steam generators with a range as high as 27,000 pounds per hour. These units are ready to generate steam when delivered and installed, and are said to have the same features found in central station units. Designs now available provide for both oil and gas firing; a coal-fired unit will be marketed shortly. Two series —pressures up to 250 lb. and pressures up to 850 lb.— are currently being produced. (*Turn to next page*)



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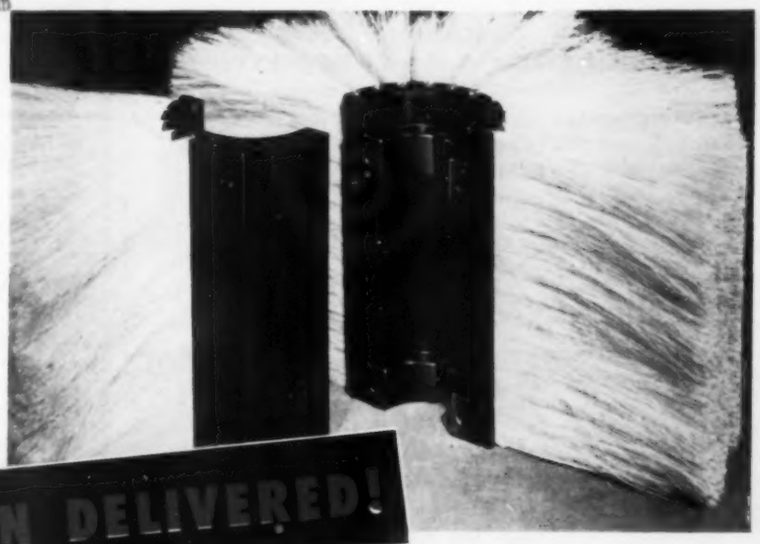
A STRONG, LOW COST, LIGHTER-THAN-METAL

PLASTIC BRUSH HOLDER

A Whiting 8-brush Mechanical Washer in use. Brushes revolving at high speed must withstand shock of impact and constant wear and tear of daily use. Strong washing solution used requires a brush holder resistant to corrosion.

Simple assembly and easy maintenance are possible with this permanent type plastic brush holder. Fullergript brush strips are easily inserted into ten molded slots of each half core.



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JOB FACTS

Part—Plastic brush holder for Whiting Mechanical Car Washers.

Material—Phenolic Plastic.

Production Data—Compression molded on 500-ton press to extremely close tolerances.

No machining required.

A special fixture was developed for speedy, economical handling of 64 lb. die insert.

Large area dies designed and made to precision accuracy by General American.

Whiting Corporation needed a new permanent-type brush holder that would permit economical brush maintenance and replacement. Wood and metal proved unsatisfactory. General American solved the problem with a plastic core specifically designed and engineered to meet these strict specifications:

Tough yet light in weight
Resistant to heat, cold, rust and corrosion
Low in cost
Completely interchangeable

The result! Whiting's new brush holder gives permanent service . . . weighs 60% less than aluminum . . . costs 80% less than metal.

Let General American plan plastics for you, too. From the design stage through final delivery you'll find everything you need to handle your part or product with speed and efficiency at the lowest possible cost.

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★ Every blade is precision made to within .001" from the finest steel.
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★ Keen, durable edges that cut cleanly, evenly and easily.
★ Special lacquer-processed to prevent rusting.
★ Uniform highest quality. Will fit accurately.

Write for samples and price list C-11 today!

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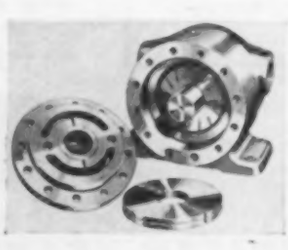
Shaft machine—The Speed-Right flexible shaft machine, designed to drive midget mills, rotary files, burrs, drills, and other carbon and high-speed steel cutting tools at the proper speed, has been introduced by the Electro-Mechano Co., 261 E. Erie St., Milwaukee 2, Wis. Positive speed control gives reduced speeds while maintaining maximum motor torque. The speed range is from 1000 to 10,000 r.p.m. Any required r.p.m. can be set at the finger-tip speed control lever, and once set, the proper cutting speed remains constant without further adjustment regardless of whether the tool is cutting or idling.

Grinding machine—Norsholm Industries, 370 W. Avon Rd., Box 384, Route 2, Rochester, Mich., is now manufacturing a self-contained and dust-arresting grinding machine for grinding or polishing phenolic and other plastics materials. It may also be used for grinding die castings, steel parts and brake linings, and may be converted into a belt sander, belt polisher, buffing wheel, or grinding wheel.

Portable pneumatic press—To take the place of large presses on such jobs as light forming, stamping, punching, and riveting, James Industries, Inc., 337 Municipal Bldg., Skaneateles, N. Y., has announced the new Pow-Air portable pneumatic press. This press has a capacity adjustable up to 1500 lb. and a speed up to 60 strokes per min. at maximum air pressure of 125 p.s.i. Controlled by a four-way solenoid air valve, it uses all or any part of 6-in. stroke. The die space measures 9 by 12 inches.

Portable attachments for drill presses—The Small Tools Div., J. D. Whittle Co., 208 N. Wells St., Chicago 6, Ill., announces four new interchangeable attachments for electric hand drill and drill press operations. These units are said to permit the user to sand, drive screws, polish, grind, file, as well as saw wood, steel, plastic, and other materials, with the same power press. They are as follows: 1) a saw and file attachment for hand drill only; 2) a 3-in. disk sander for any electric hand drill or drill press; 3) a saw and file attachment for most types of drill presses; and 4) a screwdriver attachment for any hand drill or drill press.

Carbide-tipped saws—For precision cutting of laminated plastics, DeLuxe Saw & Tool Co., 2476 Blue Island Ave., Chicago 8, Ill., announces a new special line of carbide-tipped saws. Dished in below the teeth, these saws provide the clearance normally achieved by "setting" the teeth on a blade. The teeth are ground flush with the body of the saw and permit a reduction in the kerf of the saw. This is said to provide longer, more continuous operation, and to cut down on the amount of material waste. Saws are available in diameters from 8 to 14 inches.



Hydraulic pump—Model J, an adjustable volume vane-type oil hydraulic pump for use where space is limited has been announced by the Racine Tool and Machine Co., Racine, Wis. This pump can be installed in an area as small as 6 by 6 in., and at 1000 lb. pressure maintains a volumetric efficiency of 90 percent. It is self-lubricated and available with foot or flange mounting.

KUHN & JACOB

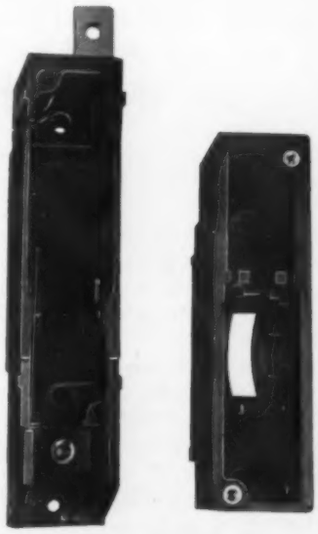
MOLDED PLASTIC HOUSINGS

Protect the Intricate Working Parts of Thousands of

HEINEMANN MAGNETIC CIRCUIT BREAKERS

Look at the Inside View of the Housing shown below . . .

This is an excellent example of clean, accurate molding, with metal inserts in exact position. Tolerances must be close to allow moving parts to function without interference. The "bugs" in this job were ironed out years ago, and the business held by strict and careful attention to the customer's needs.



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Checkers of GLADITE have smooth, lustrous finish that's colorfast and highly resistant to abrasion and chipping.

Strong GLADITE bottle caps withstand high torques. . . are proof against water, greases, oils, alcohols.

Good dielectric properties, heat resistance (to 500°F) and arc resistance (480 seconds) distinguish GLADITE electrical components.

Model building block of GLADITE has high compression strength, dimensional stability, resists scratching and chipping.

Gladite* is the revolutionary new cold-molding powder that can be molded into finished plastic parts at speeds as high as 30,000 small units per press per hour. Only one operation is involved: the single rapid stroke of a molding press. No preheating, pre-forming or after-baking steps are necessary.

Gladite flows easily. Its bulk factor is unusually low. It can be obtained in *any color* . . . each of them fast, each uniform.

Moreover, the physical properties of Gladite can be varied by formula. It can be provided with specific dielectric properties, or compounded to withstand temperatures to 500°F. All formulations have excellent dimensional stability plus exceptional compression and tensile strength.

And every finished item molded of Gladite has a smooth, lustrous surface that needs no buffing, grinding or polishing!

If you'd like to test Gladite on your equipment (either rotary, single-stroke or hydraulic presses) or investigate its utility for new applications, write now on your business letterhead for a free sample canister.

Standard shipping container for GLADITE is this sturdy 100 lb. fibre drum.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery

"Surface Chemistry for Industrial Research," by J. J. Bikerman.

Published by Academic Press Inc., 125 East 23rd St., New York 10, N. Y., 1947. Price $8.00, 464 pages.

An exposition of the fundamentals of Surface Science in all its phases—liquids, solids, gases, and combinations—emphasizing practice rather than theory.

"Practical Emulsions," by H. Bennett.

Published by Chemical Publishing Co., Inc., Brooklyn, N. Y., 1947. Price $8.50, 568 pages.

A new edition, completely revised and enlarged, with new material on the use of emulsions in leather treatment, dyeing and coloring, synthetic latex, lacquer, paints and other industrial products.

"Plastics Theory and Practice: The Technology of High Polymers," by Charles C. Winding and R. Leonard Hasche.

Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y., 1947. Price $3.50, 280 pages.

A text designed to serve as a basis for more detailed study of plastics.

"The Chemistry and Technology of Waxes," by Albin H. Warth.

Published by Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y., 1947. Price $10.00, 519 pages.

A reference work which collects and correlates material on waxes not previously available in one place.

"British Catalogue of Plastics"

Published by the National Trade Press Ltd., Drury House, Russell St., Drury Lane, W.C. 2, London, 1947. Price 50/-, 704 pages.

The first comprehensive guide for users of plastics materials in Great Britain, this catalog contains articles by specialists on various phases of the industry and detailed discussions on materials, design, methods of molding, fabricating, finishing, and types of equipment. The catalog also contains a directory of firms and has five loose wall charts giving the properties of the various plastics, plasticizers, solvents, adhesives, and paints.

"Encyclopedia of Chemical Technology" (Vol. I, A to Anthrimides), edited by Raymond E. Kirk and Donald F. Othmer.

Published by the Interscience Encyclopedia, Inc., 215 Fourth Ave., New York 3, N. Y., 1947. Price $20.00, 962 pages.

The first volume of a planned 10-volume work, to cover the entire field of chemical technology.

Resin adhesives—The Plastics Div., American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., has recently published a 12-page booklet, in full color, describing the products made by Cyanamid. The booklet illustrates the range of applications where these products have been found effective, and indicates the savings and sales advantages which may be gained through their use.

Infrared lamps—"Drying Problems Made Easy," an eight-page brochure, has just been released by the North American Electric Lamp Co., 1012 Tyler St., St. Louis 6, Mo. The brochure features Nalco Dritherm industrial infrared lamps. With photographs and diagrams, the brochure details the flexible use of these lamps in drying, curing, dehydrating, preheating, and expanding.

Lathe operation—"How to Run a Lathe," a 138-page handbook, has been released by South Bend Lathe Works, 343 E. Madison St., South Bend 22, Ind. This new, revised 45th edition covers such subjects as the operation of lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling, reaming, tapping, cutting screw threads. A number of reference tables are given. The manual is recommended for use by machinists and as a shop text in schools and apprentice training courses. Copies with paper covers may be obtained for 25¢; with leatherette covers for $1.

Industrial uses of nylon—"Nylon Textile Fibres in Industry" is the title of a new 30-page booklet being offered by the Nylon Div. of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. Sections are devoted to nylon's properties of strength, industrial uses, and aircraft applications.

Molding shop problems—Two pamphlets, "Thermosetting Moulding Compositions" and "Thermosetting Moulding Shop Problems," have been released by the Executive Committee of the Plastics Industry, The Adelphi, Adam St., W. C. 2, London, England. Discussed in detail are the problems of molders, and descriptions of all the methods of production of thermosetting molding materials.

Inverted vertical pump—A new data sheet, No. 66, has been released by the Aldrich Pump Co., Allentown, Pa., describing the Aldrich Inverted Triplex Pump for petroleum, central hydraulic, and high pressure applications. An isometric drawing and various charts are used to illustrate outstanding design features.

Sec-butylbenzene—The Chemical Div. of Koppers Co., Inc., Pittsburgh 19, Pa., has issued a new technical bulletin, C-7-104, describing its sec-butylbenzene, which it now has available in commercial quantities. The bulletin is designed to be of special interest to the research chemist, the production man, and the purchasing agent.

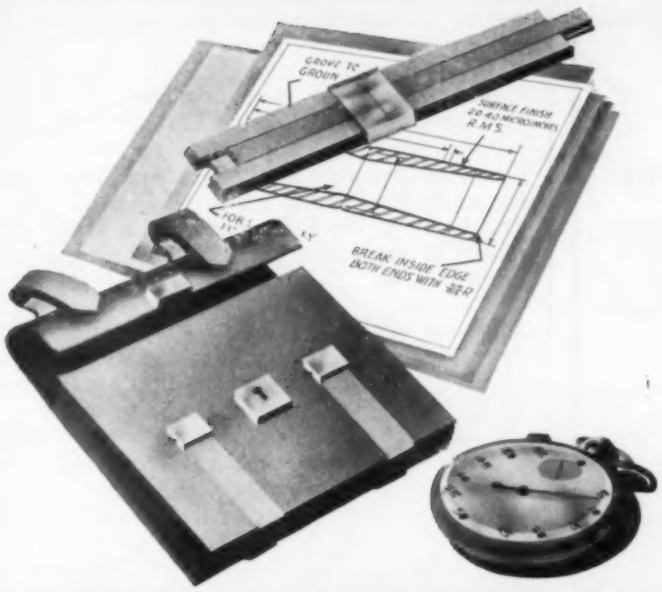
Carbon black—An attractive 19-page booklet, "Bulk Handling of Carbon Black," has been prepared by Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. It describes and pictures how carbon black handling systems work, presents costs of bulk versus bag handling, and gives the fundamental considerations for the selection of equipment, screw conveyors, bucket elevators, and horizontal belts.

Glass fiber—A 36-page booklet, "Fiberglas-Reinforced Plastics," containing up-to-date information on the properties of Fiberglas-reinforced plastics has been compiled by the Owens-Corning Fiberglas Corp.,

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
Is there a direct means for Solving Unusual Technical Problems?

ANSWER BY
CARBORUNDUM
TRADE MARK



When faced with unusual or difficult problems involving grinding, sanding or finishing . . . it is becoming the accepted practice of an increasing number of abrasive users to "Call in CARBORUNDUM."

Our sales engineers are well equipped, through training and experience, to offer intelligent suggestions on specific abrasive applications and techniques. The information they pass on to both operators and production management is especially helpful. This is reflected in the preference expressed toward abrasives by CARBORUNDUM.

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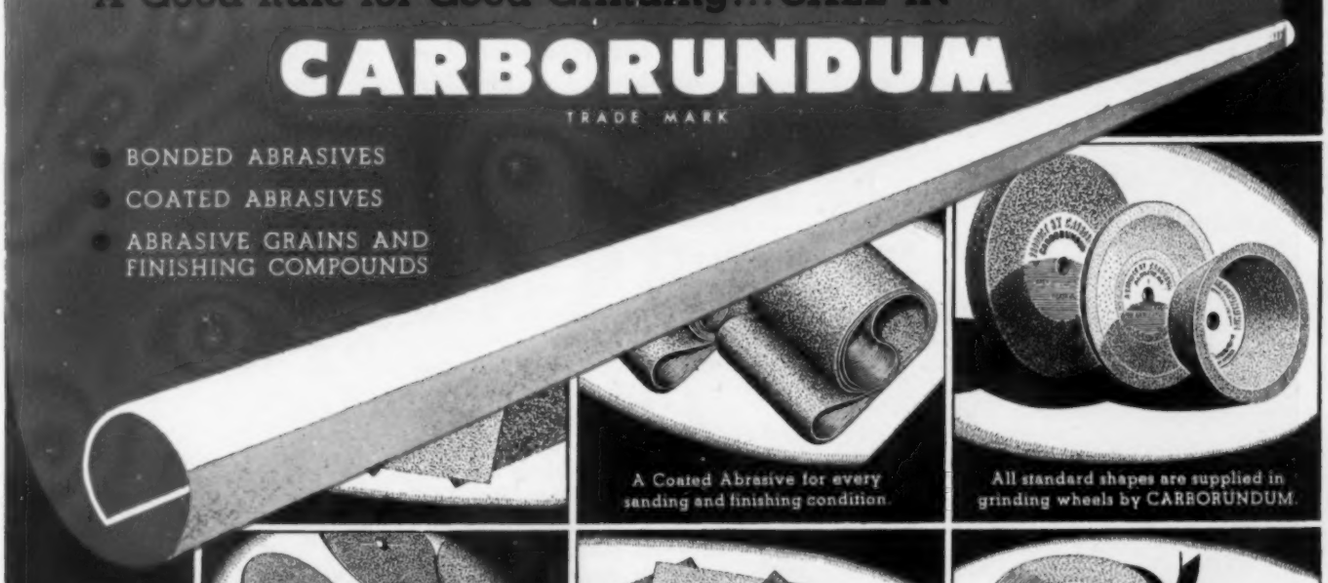

A Coated Abrasive for every sanding and finishing condition.

All standard shapes are supplied in grinding wheels by CARBORUNDUM.

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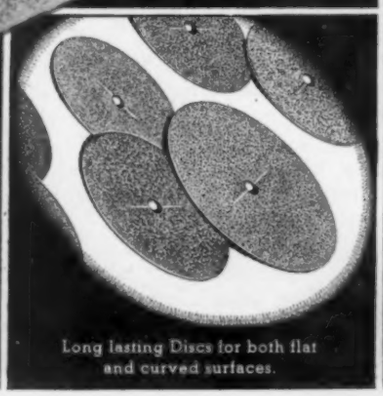
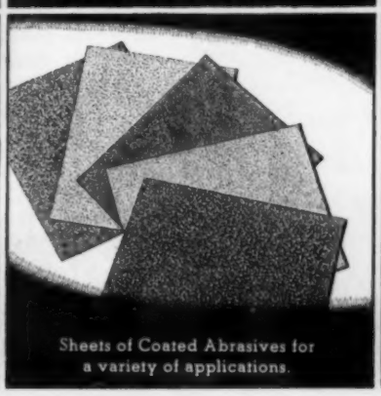
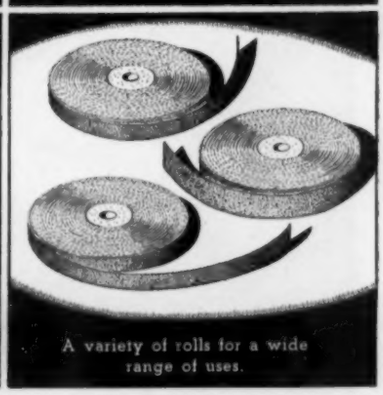


Long lasting Discs for both flat and curved surfaces.



Sheets of Coated Abrasives for a variety of applications.



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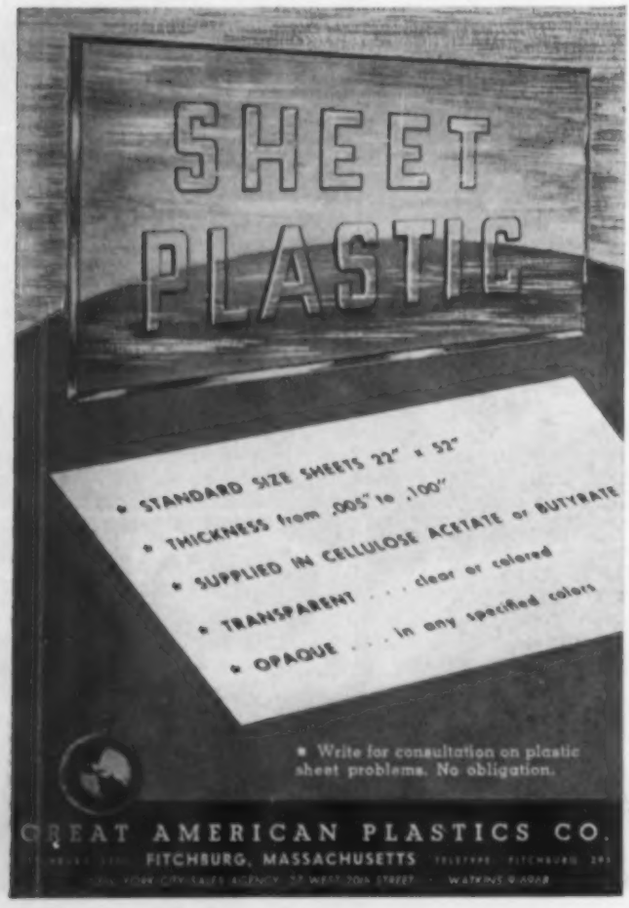
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• Write for consultation on plastic sheet problems. No obligation.
GREAT AMERICAN PLASTICS CO.
FITCHBURG, MASSACHUSETTS

Toledo 1, Ohio. A section of the booklet contains 22 charts to help the designer make a preliminary selection of the type of Fiberglas reinforcement that will best meet his requirements. The booklet contains pictures showing applications and manufacturing methods.

Metal surfacing of exceptional wear resistance—The Industrial Research Laboratories, Ltd., 961 E. Slauson Ave., Los Angeles 11, Calif., have published a 12-page engineering and production data book on Xaloy and Xaloy 306. The booklet deals with the important characteristics of Xaloy, as well as the method of fabrication, particularly as applied to extrusion machine and other cylinder liners.

Cooling water for heat insulation of presses—"The Economical Use of Cooling Water," a 40-page booklet on the use of cooling water for heat insulation of presses and subsequently for space heating, has been issued by the British Industrial Plastics Ltd., 1 Argyll St., London, W. 1, England. The book describes a means of economically using the heat taken from the press system.

Vibrating process equipment—The Jeffrey-Taylor Div., Jeffrey Mfg. Co., Columbus 16, Ohio, has prepared a 51-page booklet, "Electric Vibrating Process Equipment, Catalog 804," which will be valuable to many industries. The text describes the application of the vibrating principle to problems of drying, cooling, and process conveying, and gives details on equipment operation. Drawings show the designs available.

Chemicals—The 15th edition of "Sharples Synthetic Organic Chemicals" has been issued by Sharples Chemicals Inc., 123 S. Broad St., Philadelphia 9, Pa. This new edition gives, in convenient and useful form, up-to-date information that will assist users in selecting chemicals for application in existing processes or in the development of new ones.

Plastics and rubber—Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y., has just released a six-page booklet, "Plastics and Rubber," describing Snell's services as consulting chemists and engineers in these fields.

Printing electronic circuits—The National Bureau of Standards, Washington 25, D. C., has just published "Printed Circuit Techniques," the first comprehensive treatment of means for printing electronic circuits. This booklet, consisting of 43 pages with illustrations, and designated as NBS Circular 468, is available for 25¢ from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Adhesives and resins—The Adhesive, Resin and Chemical Div., American-Marietta Co., 3400 13th Ave., S.W., Seattle 4, Wash., has published an illustrated booklet entitled, "The Magic That is Chemistry." The booklet deals with research into and development of protein adhesives, synthetic resin adhesives, special resins, and sealers.

Material handling directory—Industrial Publishing Co., 1240 Ontario St., Cleveland 13, Ohio, has published a 404-page "Flow Directory" on material handling. Sketches and descriptions of 638 items of material handling equipment, machinery and accessories are included. The book also contains sections on products, manufacturers, trade names, and engineering data. Limited copies are available to the general public for $6 each.

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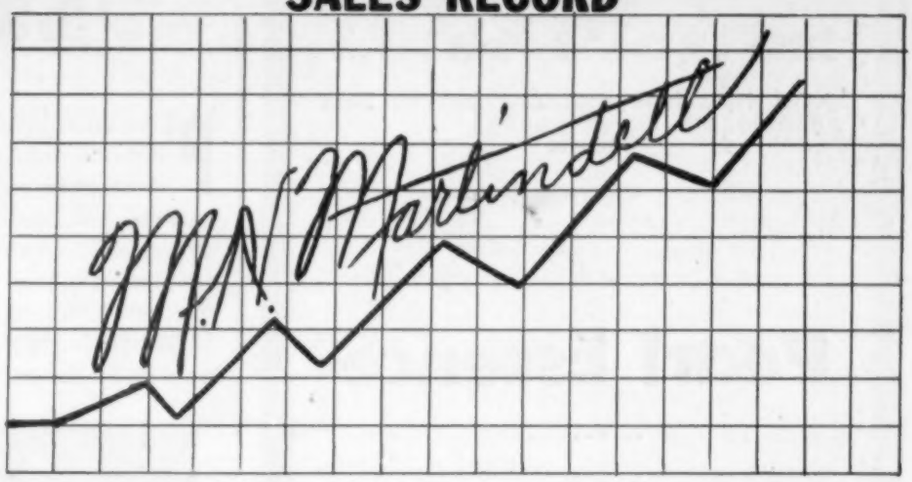

Satisfied customers bring repeat business. If your product meets requirement as to utility, appearance and cost, future orders will follow. That's where the MARTINDELL ORGANIZATION fits in. Put the molding of that vital plastic part in our hands, and watch your sales record climb.

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- *ELECTRIC PUSH BUTTON CONTROL*

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Special types have been developed for each plastic

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Consumption of

PLASTICS production figures for December were notable particularly for record breaking production in polystyrene and vinyl resins. Critics had claimed that both would fall off in December as advance Christmas buying tapered off but polystyrene went almost to 11,500,000 lb., which exceeded the record set in October and vinyls went to over 20,000,000 lb., higher than any previous month, which may be an indication of the vinyls spreading out into

PLASTICS AND SYNTHETIC RESIN CONSUMPTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods, and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[a]
All other, including casting (dry basis)[c]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[c, d]
Total
Polystyrene[c, e]
Vinyl resins
Sheeting and film including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other including adhesives (resin content)[c]
Total
Miscellaneous
Molding materials[a, f]
All other (dry basis)[c, g]
Total
Grand Total

[a] Includes fillers, plasticizers and extenders. [b] Data cannot be published without disclosing operations of individual establishments. [c] Excludes data for protective coating resins. [d] Excludes urea and melamine molding materials; see footnote [f]. [e] Dry basis, including necessary coloring material.

Plastics Materials

an ever increasing field of applicability. The 1947 yearly production of polystyrene of 95,000,000 lb. compares favorably with the 67,000,000 produced in 1946. The vinyl yearly total of 184,000,000 lb. is a good increase over the 140,000,000 produced in 1946. Phenolic molding powder was back up in the 17,000,000-lb. class which again emphasizes the need for formaldehyde and phenol, and an apparent continuation of the trend toward more large size pieces.

POUNDS FOR JAN. THROUGH DEC. 1947
Source: Industry Division, Chemical Co.

November 1947	*December 1947*	*Total for 12 months*
lb.	*lb.*	*lb.*
480,586	475,043	7,227,370
756,046	614,081	7,843,613
225,429	254,241	3,851,354
4,665,939	3,829,623	58,534,379
6,128,000	5,172,988	77,456,716
609,314	627,630	9,216,859
222,801	213,928	3,668,652
832,115	841,558	12,885,511
[b]	[b]	1,685,554[c]
3,241,623	3,513,157	40,546,186
1,892,302	1,920,235	21,069,409
15,415,038	17,160,488	194,315,872
5,170,255	5,067,639	63,445,691
25,719,218	27,661,519	319,377,558
3,904,009	4,210,386	48,454,384
1,535,600	1,634,764	16,862,315
559,647	719,421	7,785,087
5,999,256	6,564,571	73,101,786
10,593,297	11,455,593	94,985,618
7,242,552	8,094,122	66,425,689
1,679,764	2,182,831	17,235,802
5,759,749[b]	7,828,786	73,113,605
2,155,408[b]	2,297,927	27,062,369
16,837,473	20,403,666	183,837,465
4,589,182	4,540,150	56,148,825
2,531,029[b]	2,641,584	29,568,704
7,120,211[b]	7,181,734	85,717,529
73,229,570[b]	79,281,629	849,047,737

[a] Includes data for urea and melamine, acrylic acid and miscellaneous molding materials. [c] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. [b] Revised. [c] Total, Jan. through April only.

Color Plastics
quickly cheaply

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REZ-N-DYE is not a coating or paint . . . the color is actually absorbed and trapped beneath the surface of the plastic. Color intensity is determined by length of immersion.

You can use REZ-N-DYE to color acrylic, cellulose acetate butyrate, cellulose nitrate, ethyl cellulose, vinyl and some phenolic. It's perfect for coloring buttons, belts and all other small and medium size plastic articles.

Other REZ-N-BRAND plastic necessaries are REZ-N-GLUE, REZ-N-LAC, and REZ-N-BOND.

Write today for prices and folders describing all these products.

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reduce moldmaking time to DAYS . . .

You get *cast* components, easily worked for fit. They require minimum stoning and buffing. Compressive strength is 20% greater than tool steel. SS forces and cavities are corrosion-proof, accurate to a hairline, longer lasting. Get into production faster — eliminate last minute tooling damage — save on costs.

Write for Complete Data
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& COMPANY Inc., 189 W. Madison St., Chicago 2, Illinois
Sub Agents for: Michigan, Indiana, Illinois, Wisconsin, Iowa

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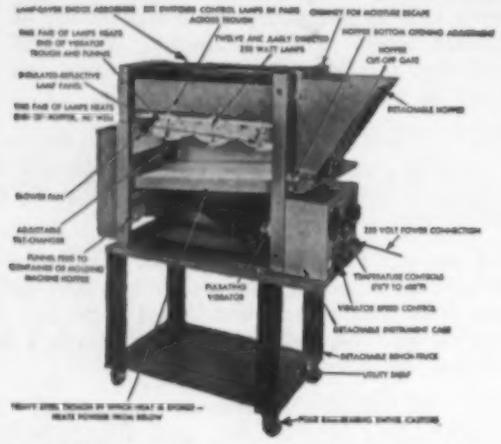

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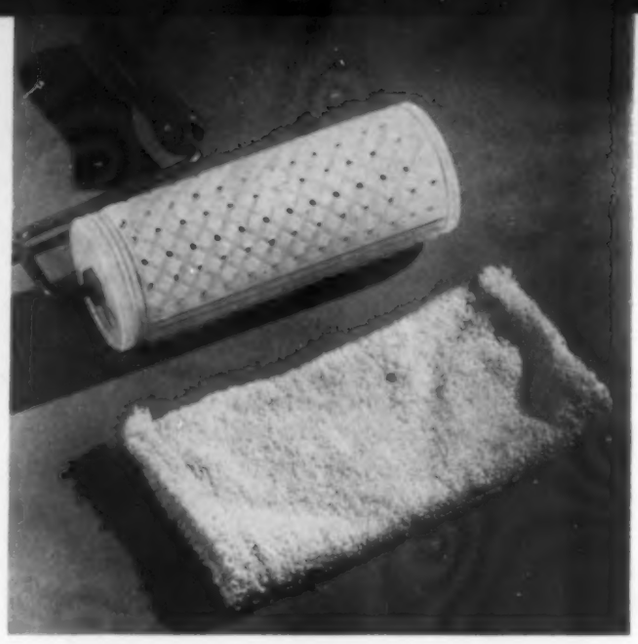

Complete paint roller unit consists of polyethylene body, handle, and cloth cover. Cylinder will hold pint of paint

Paint Roller

WHEN the idea of a self-feeding paint roller was first conceived by the Self-Feed Painter Co. of Sarnia, Ontario, the company planned to use metal for the cylinder. But the experimental metal rollers proved impractical because of weight and high manufacturing costs and the company was faced with the problem of finding a material light enough yet chemically resistant to standard oil paints, enamels, and the casein type wall paints.

After considering the requirements, Robinson Industrial-Crafts Ltd., London, Canada, recommended polyethylene. Test models molded by Robinson were highly satisfactory and were found to have the additional advantage of flexibility, thus allowing the roller to apply paint to uneven surfaces. Performancewise it is claimed that a person can paint a wall 10 times faster than with an ordinary paint brush. And the roller can be kept full of paint without leaking.

Holes molded at angle

The plastic cylinder is molded in three parts—the hollow perforated body with one end molded in, a round disk fitting over the other end, and a small plug which fits into a hole in the disk. To operate, a terry cloth covering is slipped over the cylinder body, the seam fitting into a molded-in groove. As much as a pint of enamel or other paint is then poured in through the disk hole and the plug inserted. This paint feeds through the angled holes in the cylinder and is dispersed under the cover through the network of grooves, with the result that the cloth cover is saturated uniformly.

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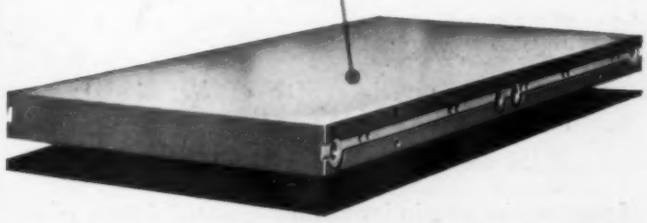

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Plastics Division
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When this unit is to be used for preparing orange juice, section comprising juicer and strainer is inserted in base

Juicer-Shaker

ON triple duty is the newly developed Juice-A-Shake which is a squeezer, strainer, and shaker rolled into one. It is equally at home in the kitchen, bar, or rumpus room.

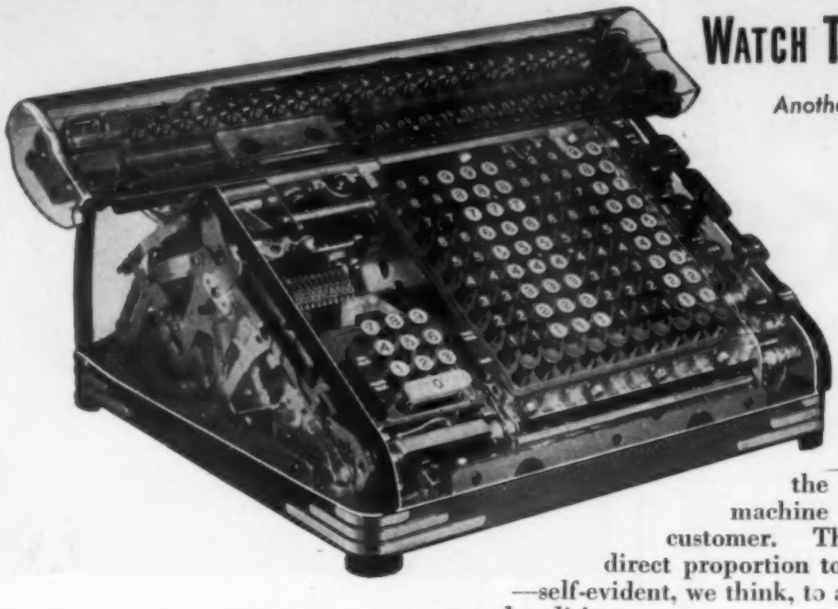
The product was designed by Barnes & Reinecke Inc., and is molded by Tech-Art Plastics Co., Long Island City, N. Y., for Kerel Products Co., New York, N. Y., from Melmac melamine resin.

Melamine resin was chosen because it combines durability with ease of cleaning and a minimum of necessary care. Also, it is non-toxic, odorless and tasteless, and heat resistant.

The shaker is a three-piece molding, consisting of base, top, juicer and strainer section. The Juice-A-Shake comes in four attractive color combinations (black and red, ivory and red, ivory and blue, and ivory and green).

The shaker has varied and wide uses including the making of milk shakes, egg nogs, and numerous mixed drinks.

With the juicer section removed and lid fitted on, the unit can be used for making mixed drinks, egg nogs, milk shakes



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BETTER QUALITY
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DESPATCH PLASTICS PREHEATING OVENS

For dependable, trouble-free preheating where job requirements are varied, you'll get excellent results immediately with a compact DESPATCH Oven . . . *placed right beside each press!* This method, recommended by scores of compression and transfer molders, is used at Midwest Molding & Mfg. Co., experienced custom molders in Chicago.

This assures an ever-ready supply of correctly heated material . . . requires no tedious adjustments or button-pushing . . . eliminates danger of over- or under-heating. Press operator can set his own molding cycle, merely removing preforms from oven drawer as needed, not before. *Amazingly convenient, practical, economical . . . first choice of countless shops* (names on request).

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DESPATCH PTHD-6 OVENS (6-drawer) at Midwest Molding & Mfg. Co. (Chicago). When in use, each oven is placed beside a compression molding press. Drawers are 12" x 12" x 2¾". Automatic thermostat control; heat range 100° to 450° F. Uniform forced-draft heat. *Complete range of drawer, flap-door and batch type ovens for ALL plastic requirements.*

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That's your introduction to the most complete plastic mold shop in New England!

It's your introduction to Cook "know-how" . . . to a whole shop full of plastic mold craftsmanship . . . to the answer to your problems in plastic mold design, development or manufacture of injection, compression or extruding molds!

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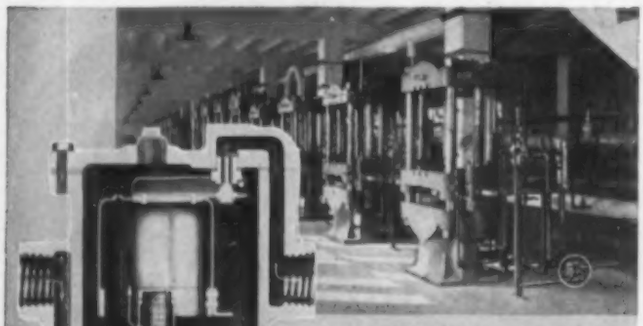

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Where seconds count and service is hard, no trap is faster nor more rugged than the Sarco Bucket Trap. It is used by the thousands in plastics, textile and chemical plants. It has a straight through connection and a built-in strainer which reduce installation costs.

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Small enough to be held in the palm of the hand, this polystyrene travel kit contains tooth brush, tooth powder, razor, razor blades, and cylinder of shaving cream

Travel Kit

THE ultimate in compactness is achieved by a new pocket size polystyrene travel kit which holds a tooth brush, a supply of tooth powder, a razor, extra razor blades, and a cylinder of shaving cream.

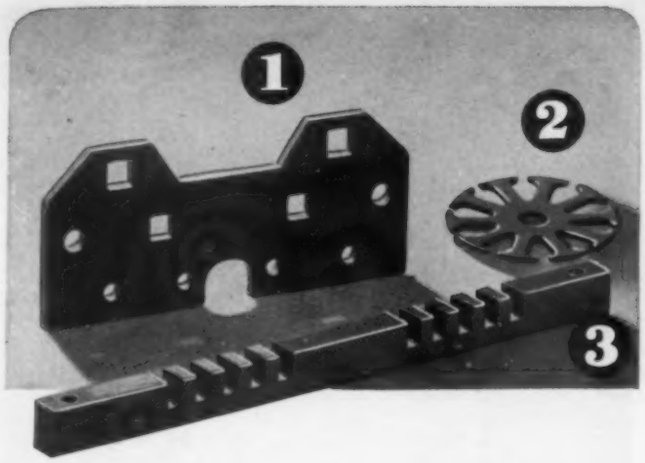
Economy of space

The case, called the Itinerette, was designed during the war by a Navy machinist for his own use. Economy of space was achieved by designing the tooth powder cylinder so that it also serves as the tooth brush handle, the razor handle, and as a plunger for ejecting shaving cream from its container. The latter container fits over the mouth of shaving cream tubes for ease in filling.

The kit is now being made commercially by the Itinerette Products Co., Vallejo, Calif. The case of the kit is injection molded by Teksun, Inc., Los Angeles, Calif. Polystyrene was chosen for the application because of its dimensional stability and water resistance. Lustron is the specific material used in the case, which is offered in black, ivory, or mottled Italian marble.

Hinge cuts assembly costs

An interesting feature of the case is the fact that assembly costs were cut by the use of a spring hinge which is held in place by its own pressure. The hinge, which is specially designed for use with themoplastic materials, is manufactured by Cavu, Inc., Downey, Calif.



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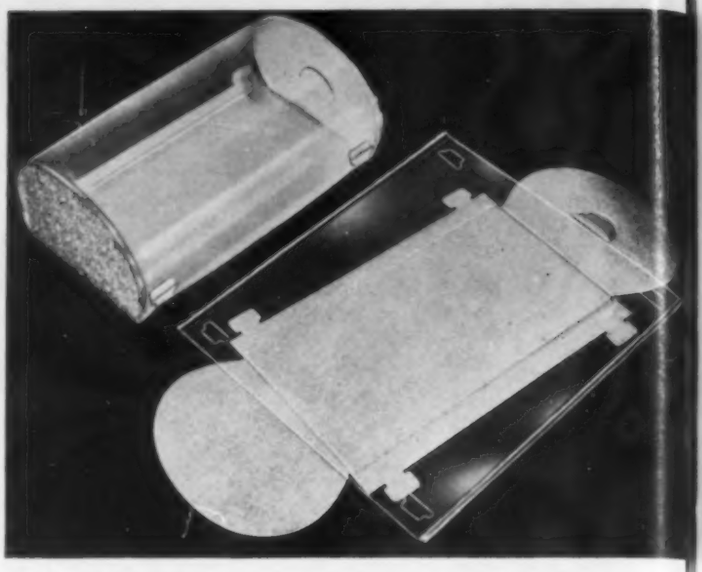


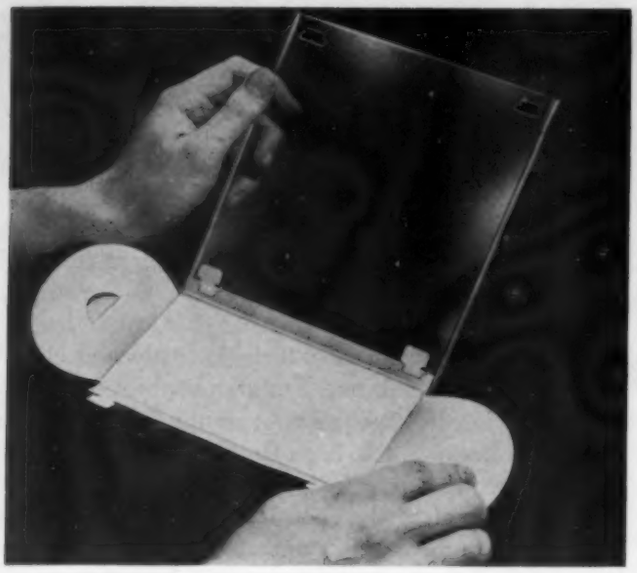
1—Assembled box, upper left, consists of cardboard base and cellulose acetate top. Below is box in knock-down form

Folding Boxes

CARDBOARD and transparent cellulose acetate sheet are ingeniously combined in a knock-down transparent box which can be shipped or stored flat, but can be set up in a moment. The box combines the advantages of easily shipped flat containers with the special sales appeal of rigid transparent boxes. Because of its simple design, the Vu-Lockbox costs 60 to 80% less than comparable sized circular or rectangular rigid set-up boxes.

Plastic Artisans, Inc., White Plains, N. Y., makes the boxes in sizes ranging from 3 by 4 in. to 20 by 20 in. They are available with bases of plain, printed, embossed, or decorated cardboard.

3—With one edge of the acetate sheet locked to one side of base, the sheet is curved to form the dóme-shape top



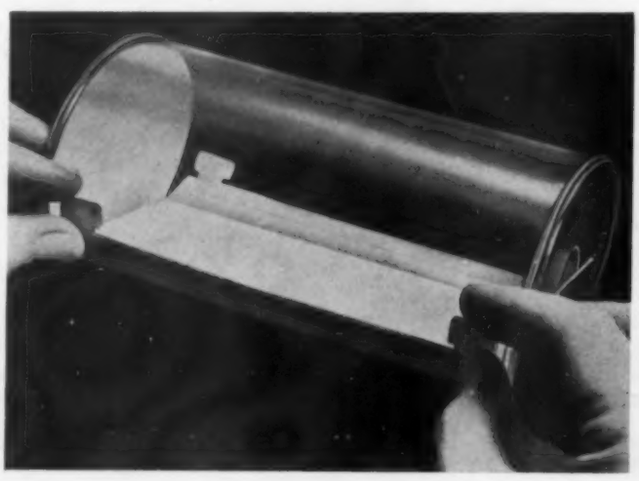
2—The die-cut, beaded acetate top is locked to one side of the base by cutouts in the acetate and lips on the base

The cardboard bases are die-cut and scored (for easier folding) in one operation. The edge of the acetate sheet is first formed in a double bead so that it will hold the cardboard sides of the box firmly, and then blanked and die-cut. The material used is .010 gage sheet supplied by Monsanto or Celanese.

Method of assembly

To assemble the box, the cardboard base is first folded on the scored lines. One side of the acetate is then locked to the side of the base by means of the two T-shaped lips on each side of the base and corresponding cut-outs in the acetate sheet. The transparent sheet is then curved to a domed shape and the other side of the acetate locked to the base in the same manner. The ends of the cardboard base are folded up and snapped into the groove formed by the beaded edges of the acetate.

4—Ends of base are snapped into place between the double bead of the acetate, and the side is locked to base



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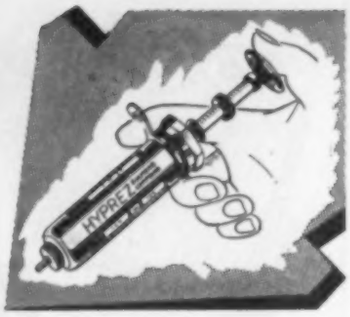

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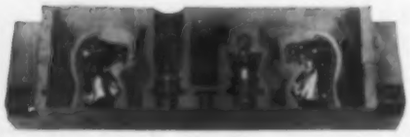

Section of four-cavity split mold, for chess set; hardened steel (not plated.) Produced and HYPREZ-FINISHED for Galland-Knight Company, Chicago, by Artag Engineering Works, Chicago.

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Portable Planetarium

PHYSICAL characteristics and ease of fabrication led to the use of rigid vinyl sheeting in a portable planetarium recently developed by Science Associates, Philadelphia, Pa. The plastic was chosen for the Spitz Planetarium because it is non-warping and has good rigidity even when used in relatively light and thin sections. Also, it drills easily and cleanly, is easily cemented, and can stand vibration and occasional hard usage without denting or deforming.

This compact, 3 ft. high unit, which weighs about 25 lb., projects on any suitable surface the images of stars down to the fourth magnitude. Constellations are immediately recognizable and the illusion of the heavens may be reproduced as they appear from almost any spot on the earth.

Twelve sheets of Bakelite Vinylite plastic form the projection medium's dodecahedron housing. Each sheet has openings in it so that light, produced by a bulb inside the housing, shines through in proportion to the relative size of the stars.

Another feature of the portable planetarium is a light pointer used for directing attention to a particular star in a darkened room. Star charts are also furnished for use in conjunction with demonstrations and class-room work.

The new Spitz planetarium is now in use at a number of colleges and other institutions.

Rigid sheets of vinyl comprise the dodecahedron housing in this recently developed portable planetarium

PHOTO COURTESY BAKELITE CORP.

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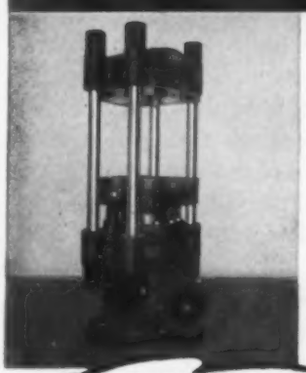
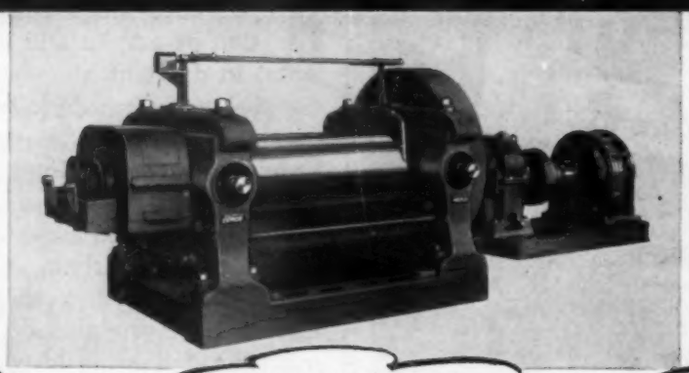
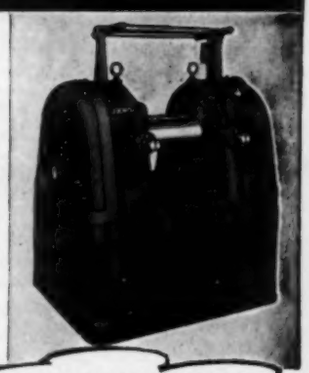


PRESSES



HEAVY DUTY MILLS



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New type of outdoor sign lighted from within by cold cathode tubes, right, is compared with old style sign at left

Acrylic Sign

Is easy to read by day or night

A NEW approach to large mass-produced signs has been made possible through the utilization of acrylic and its light-piping characteristics. In daylight, the shadowed side of a conventional sign is often dark and difficult to read. However, in the new acrylic signs, both sides can readily be seen at all times. The rays of the sun are diffused evenly during the day and, at night, light from two cold cathode tubes mounted inside the sign illuminates the sign clearly.

About two years ago, the Sun Oil Co., Philadelphia, Pa., began testing plastics, wood, metals, paints, and methods of lighting in order to develop improved signs for its service stations. A Lucite sign measuring 4½ by 9½ ft. and featuring the company's red arrow and yellow diamond was decided upon for a number of reasons. It is weather resistant, easily cleaned, and shatterproof. Holes caused by stones can be patched. Electric bulbs and vulnerable outside tubing are unnecessary and no painting is required because the bright colors are integral.

Sides of the diamond and arrow are formed by the Ranger-Tennere Co., New York, N. Y. The diamond sides are corrugated for greater strength and a wide strip is raised to accommodate the blue Lucite letters spelling "Sunoco". Cutler Sign Co., New York, N. Y., does the assemblying.

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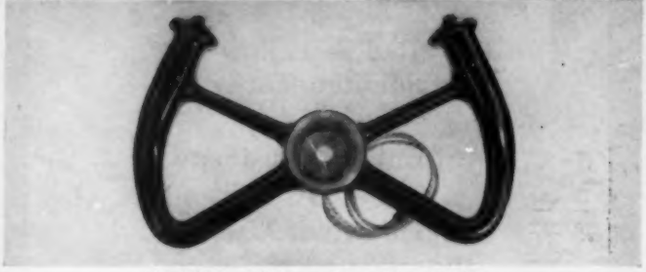
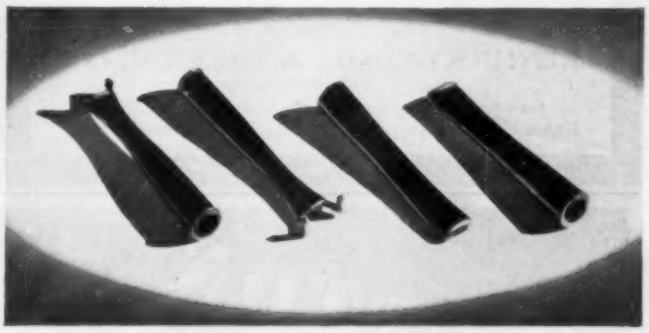
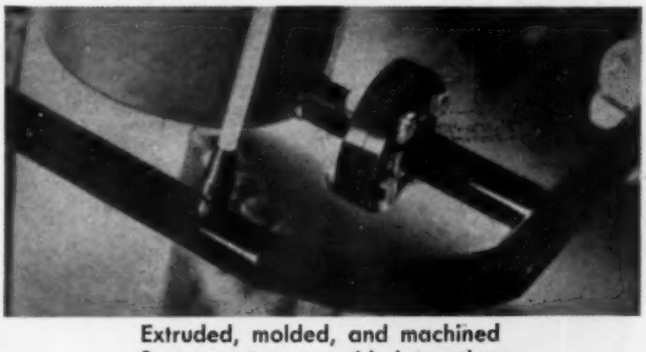
A FEW CASES IN POINT WITH ACE PLASTICS



Molding dimensionally stable, tough, Tenite II over a magnesium steering wheel called for plenty of molding skill—provided by ACE.



ACE-designed, completely automatic mold reduced the cost-per-piece of these new pipe bits molded of acrylic plastics.



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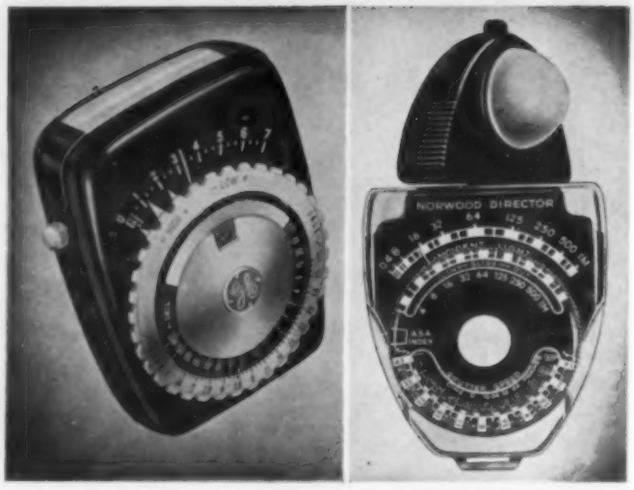

Polystyrene is one of four different plastic materials incorporated in meter at left. The meter at right employs phenolic, acrylic, and cellulose acetate parts

Exposure Meters

THE increasing use of plastics in exposure meters is evidenced by two meters recently put on the market. One of them uses polystyrene, phenolic, acrylic, and a cloth-based laminate; the other has phenolic, acrylic, and cellulose actetate parts.

The new General Electric meter (left, above) has a molded polystyrene lens which improves the distribution of light on the surface of the photocell and thereby increases the photometric efficiency of the meter. The window on the scale plate (for computing exposures) is transparent acrylic.

The black case of the meter is molded of a cotton-flock phenolic compound developed during the war for the Navy by the Plastics Div. of General Electric Co., Pittsfield, Mass. A regulator inside the meter is made of a cloth-based laminate 0.015 in. thick.

Swivel head

The Norwood Exposure Meter, made by the American Bolex Co., New York, N. Y., has six plastic parts. One side of the main body of the meter (right, above) is molded of phenolic, the other side of acrylic. A circular acrylic piece fits into an indentation in the acrylic part of the housing and is mounted so that it is free to revolve. The two acrylic pieces are calibrated so that they can be set to compute the proper lens aperture and exposure time after the light has been measured by the photo-cell circuit.

The swivel-mounted head of the meter has a two-piece phenolic housing. A dome-shaped piece fabricated from cellulose acetate sheet is designed to pick up incident light.

Plastic parts for the Norwood meter are made by Northern Industrial Chemical Co., S. Boston, Mass.

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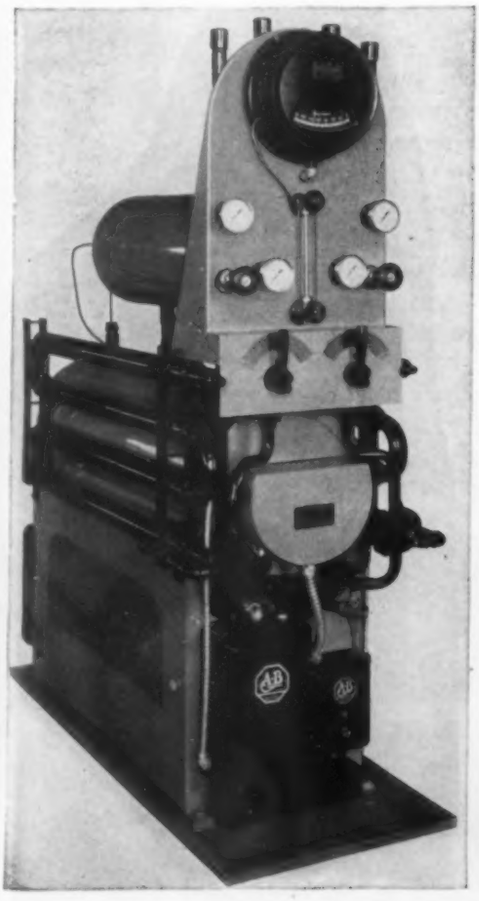

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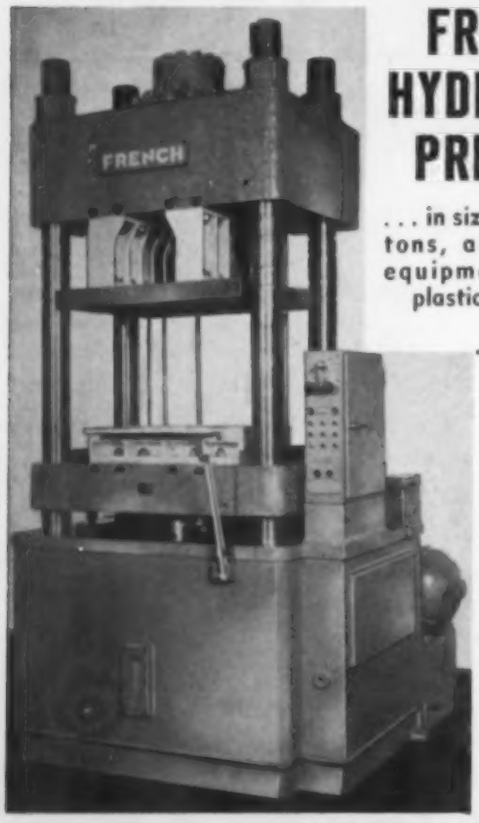

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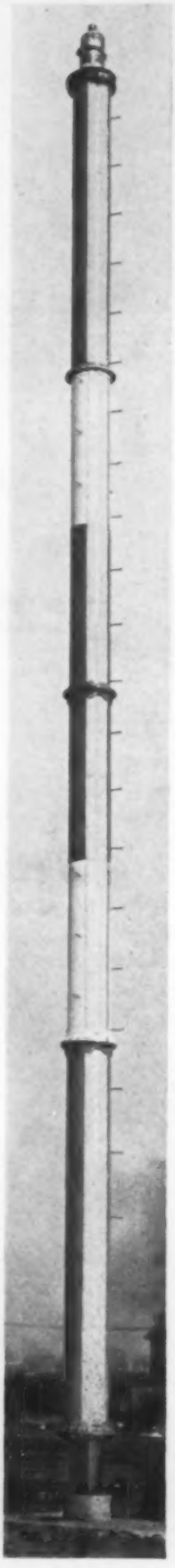
Pylon Antenna

AN unusual application of polyethylene is found in the RCA Pylon FM Broadcast Antenna. The Radio Corporation of America designed the antenna to replace the conventional broadcast tower, which is cluttered with loops, dipoles, and other radiating elements. The new pylon is light, easy to erect, needs no guying, and has no protruding appendages.

The pylon, which comes in sections 13½ ft. long and 20 in. in diameter, is theoretically an infinite number of loops stacked vertically. The termination of these loops forms a vertical slot which runs the full length of the pylon.

To cover the slot and prevent foreign matter from entering the cylinders, RCA uses a 90 mil sheet of polyethylene, laminated from three layers of 30 mil sheet extruded by the Plax Corp., Hartford, Conn.

Polyethylene was chosen for its low moisture absorption, low electrical losses at 100 mc., flexibility at low temperatures, and serviceability at high temperatures. The only other material considered capable of doing the job was tetrafluoroethylene, which was impractical from a cost standpoint.



Right: A completed Pylon Antenna. Below: Before erection, the slot is covered with polyethylene sheet

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NATCO A-33A Combination Hand and Foot and Air Oil Feed Machine with or without air operated automatic rotating table

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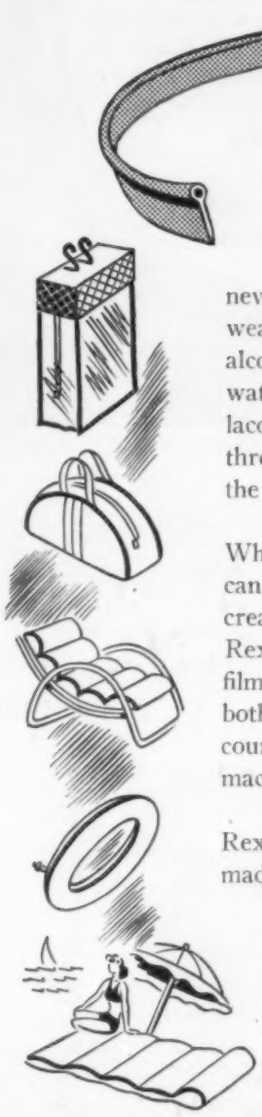
all colors, solid or tubular bead



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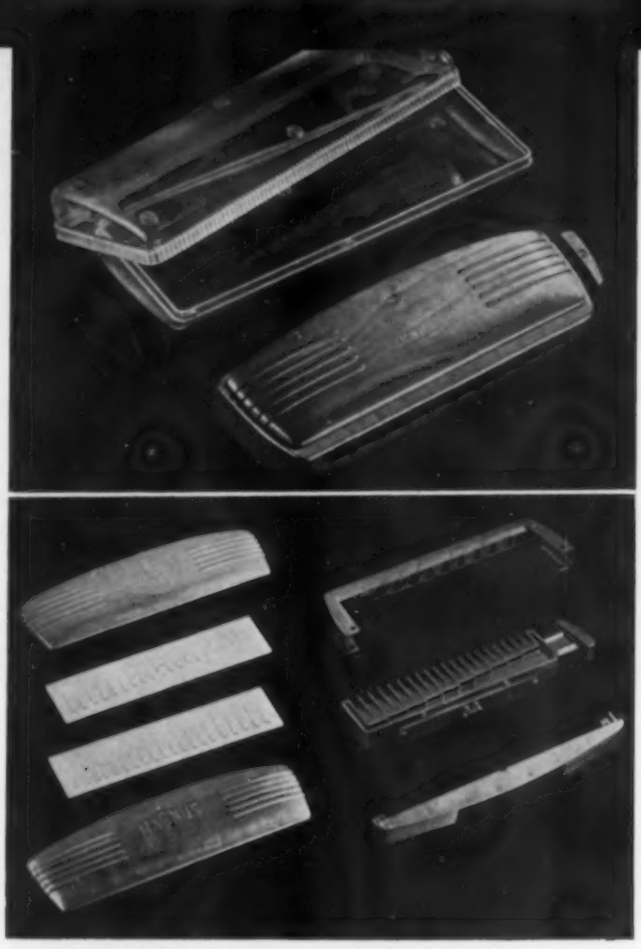

PHOTO COURTESY BAKELITE CORP.

At top is polystyrene container and assembled harmonica showing shift-key on right. Below are pictured the essential units of the new 14-part polystyrene harmonica

Harmonicas of Plastic

ECONOMY in production of modern harmonicas is now achieved by the fact that these harmonicas, molded of polystyrene, have only 14 parts as compared with the 159 parts of the old type made of metal and wood. Polystyrene is used in these low-cost instruments, claimed to have exceptional musical qualities, because it is tasteless, non-toxic, and is lighter then materials formerly used. This advanced type harmonica was developed by the Magnus Harmonica Corp., Newark, N. J.

In the production of the old-type harmonica, over a hundred operations were necessary to produce the reed assembly. Now the reed units are molded of Bakelite polystyrene in a single operation, with the tuned reeds as integral parts of the plate. The polystyrene reeds, because of their relative thickness, retain their springness and provide a rich, mellow tone.

This chromatic harmonica features a new shift-key for playing the sharps and flats. When the key is in the "out" position only the diatonic reeds respond; when the key is pressed in, the chromatic notes respond. The required semi-tones are produced by turning the shift-key with the finger.

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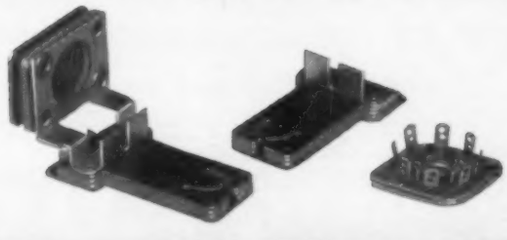

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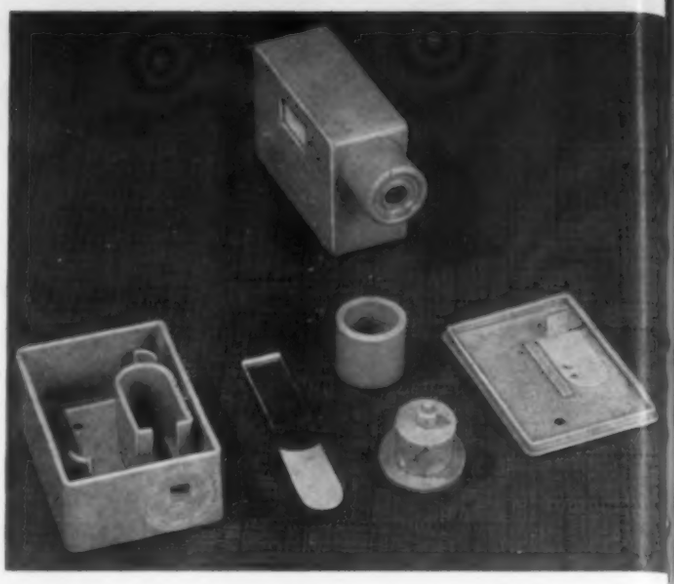

Disassembled viewer shows acetate case, cover, eyepiece, wheel, and light diffusing window. At top is assembled job

Film Viewer

A FILM viewer molded of acetate, which uses 16 mm. film in a continuous loop, is being molded by the Hardy Plastics and Chemical Corp., Brooklyn, N. Y., for the Comicscope Co. of America, New York, N. Y. The product is sold under the trade name of Filmatic.

Four plastic parts

The viewer is produced in an eight-cavity die which turns out two each of the following four pieces: the case of the viewer; the cover for the case; the eyepiece; and the wheel which turns the film. The remaining pieces are two light-diffusing windows which are cut from cellulose acetate sheet and inserted in the sides of the case, the glass lens which is inserted in the molded eyepiece, and a glass mirror for reflecting light from the window through the film.

The rim of the wheel, which extends through the rear of the viewer's case, has prongs that engage the perforations on the film. A slight movement of the finger will turn the film to the next picture frame. A whole strip of 22 pictures can be seen in sequence.

Comic strips featured

A strip of film, featuring Joe Palooka, goes with the viewer. Additional film featuring other famous comic book characters are available.

Sales of the viewer are now being handled by city department stores. Direct mail sales for the viewer and additional film are being stimulated by advertisements appearing in comic books.

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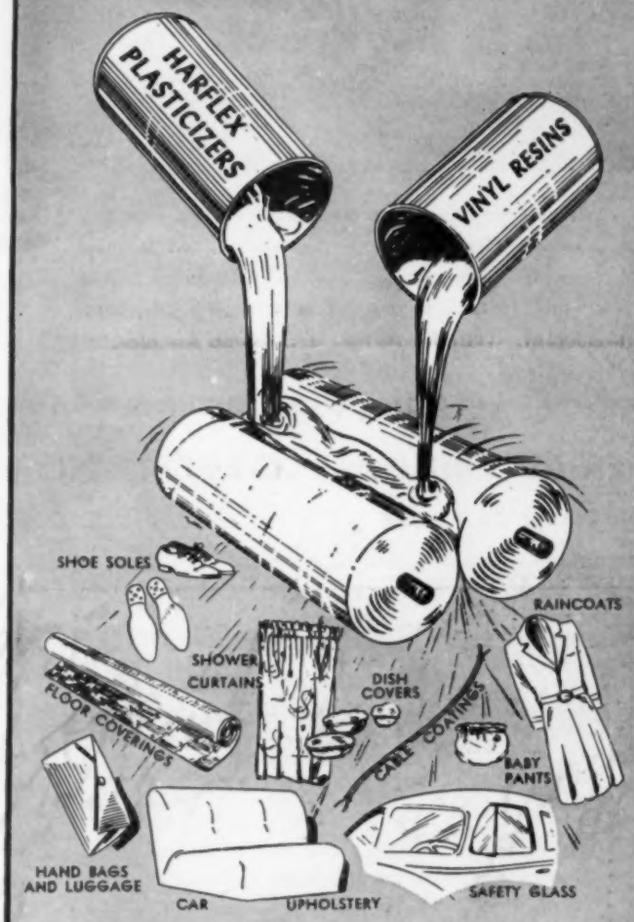

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Re-use Container

A TRANSPARENT container for cottage cheese, molded of Dow polystyrene and designed for multiple re-use, has been produced by the Southern California Plastics Co., Glendale, Calif.

The new injection molded container, produced in four-cavity molds, has proved to be a powerful sales stimulant for cheese produced by the Golden State Co. Ltd., of California. It is a covered dish, 4 by 4 by 2½ in., in pastel hues of blue, pink, green, and amber. The container will hold a full pint of the product.

Promoted through newspaper advertising and point-of-sales material, the container is recommended for re-use as a refrigerator dish, a picnic lunch container, for molded salads and desserts, for packaging homemade gift candy and cookies, and for scores of other household uses.

Designed for stacking

The dishes are so designed that they can be stacked in the refrigerator and nested when not in use. They are also chip-proof and more durable than glass. The tightly fitted cover, which is lipped for ease of handling, is ideal for storage purposes.

Extensive tests made in Golden State's laboratories proved that the polystyrene material would have no detrimental effects on the cheese when in direct contact with it.

Customer reception of the new plastic container is indicated by the fact that in the first two months of use, more than a quarter of a million units were sold in Southern California alone. Since the plastic container did not displace the usual Golden State carton, which sold during those months at a normal rate, the dairy is convinced that the new cheese customers were won over by the appeal of the container.

Once the cheese is gone, this polystyrene container can serve as a refrigerator box or used elsewhere around the home

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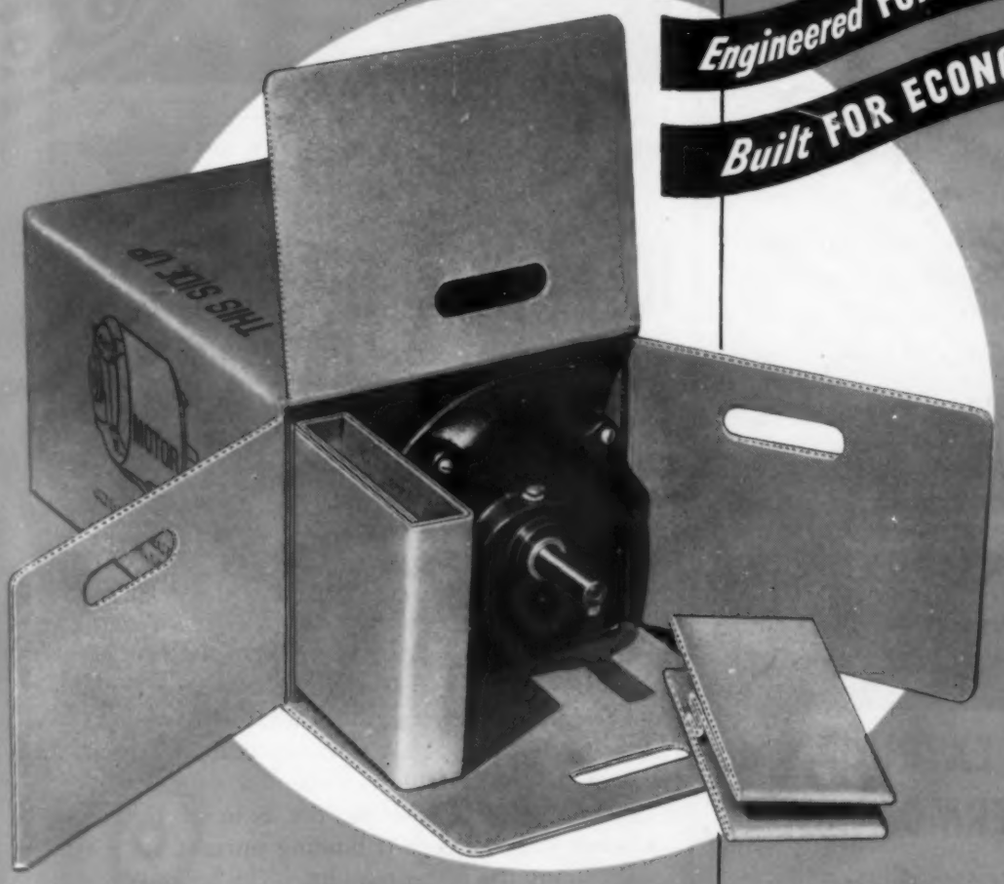
Engineered FOR STRENGTH

Built FOR ECONOMY



H & D corrugated boxes do *more* than protect in transit; they cut packing time, material costs, freight charges—pare distribution expense to the core. Easier to handle, warehouse, *sell*, H & D-packed products bring more profits to the manufacturer . . . at *less* cost to the buyer. Remember—H & D boxes make a good product better. Consult the H & D Package Laboratory on ALL packaging problems.

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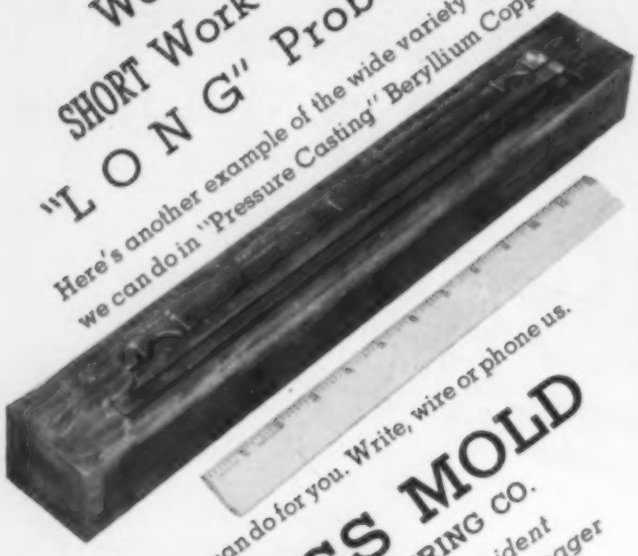

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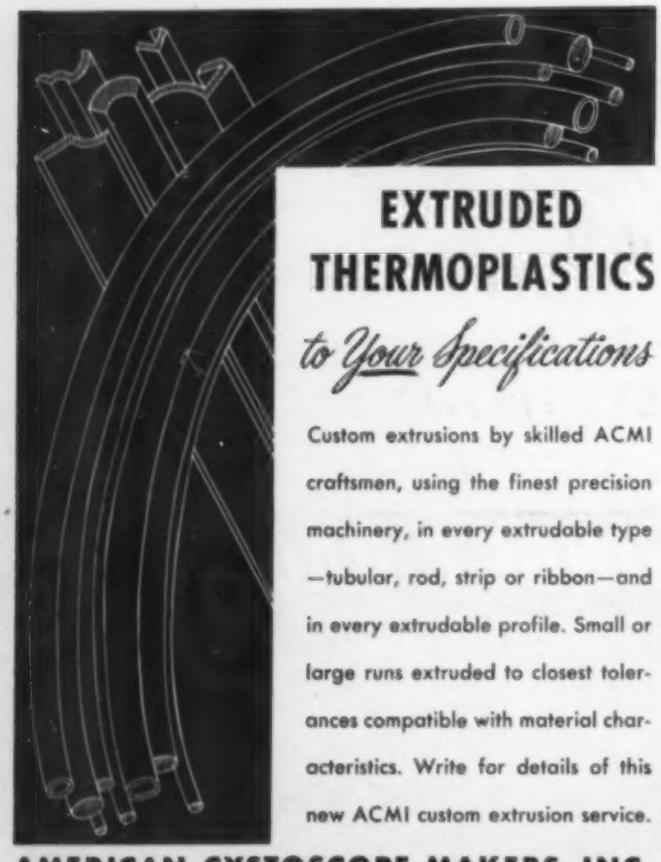

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Two eyelets are molded in base for stringing the decoys together. The lead plate balances them on the choppiest water

Realistic Decoys

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A 15 oz. lead plate on the base of the decoy balances it and keeps it floating upright, no matter how choppy the water may be. The balance weight is flat so that decoys can be set upright on dry land.

At either end of the Tenite II base are molded eyelets for stringing the decoys together.

Molded of transparent cellulose acetate butyrate in two parts, decoys are cemented into airtight bodies, lacquered

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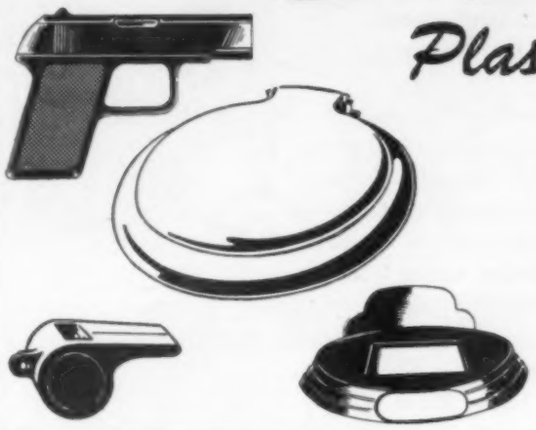

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This is useful primarily to manufacturers who compound plastic materials. The machine may be used to reduce material for use as a commercial product without further granulating. Or it may be used to prepare material for subsequent final reduction in a granulating machine.

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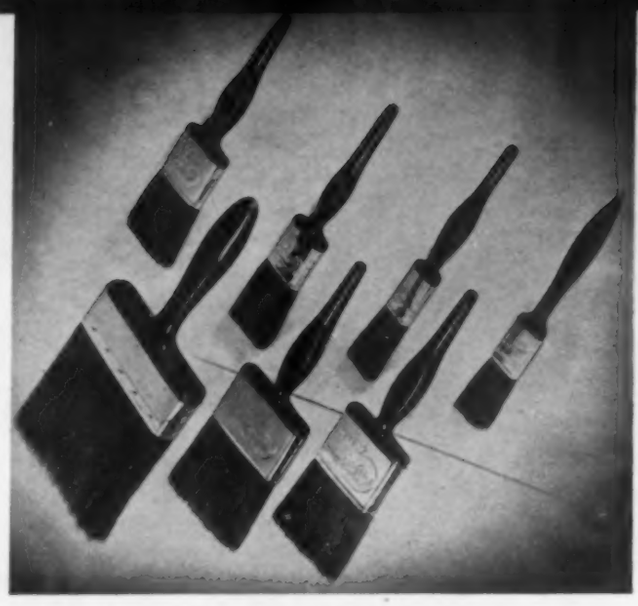


Paint brush handles in 28 standard sizes are transfer molded of high impact phenolic or of bright colored urea

Paint Brush Handles

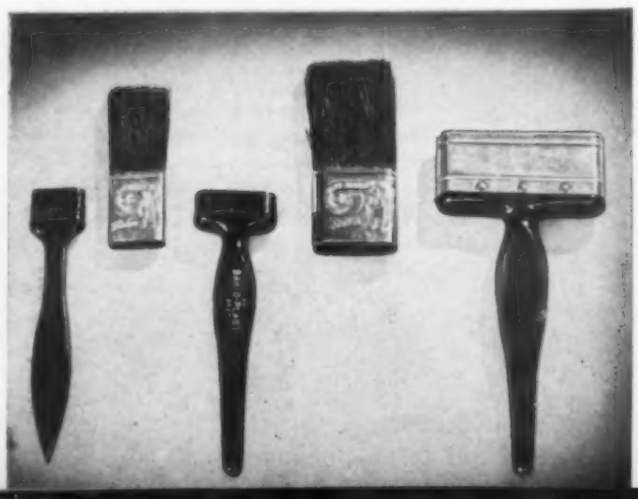
THE paint brushes illustrated on this page may well be the fore-runners of a revolution in which plastics will replace wood as a material for paint brush handles. The handles illustrated are molded of high impact phenolic by Mutual Metal & Plastic Corp., Brooklyn, N. Y., for the Baker Brush Co., New York, N. Y.

Mutual is molding the brush handles in 28 standard sizes and shapes ranging from ½ in. to 6 in. wide. In addition to phenolic, the handles are available in any standard color of urea.

The plastic handles have a cost advantage over wood, and are unaffected by turpentine and other solvents used in paints. The metal ferrules which hold the bristles are fitted against a molded-in shoulder and attached to the handles by swedging, rivets, or screw-nails.

Mutual is tooling up to mold over 20,000,000 brush handles per year, and is working on a method of setting bristles directly in the plastic.

Larger brushes have ferrules attached with screw nails. Smaller models are joined by patented swedging operation



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Polyamides in Germany

(*Continued from page* 126)

tion, evolving 73.5 kcal./mol and giving over 90% yield of adiponitrile at a cost of 1.60 RM/kg.

Hexamethylenediamine

$H_2N\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}NH_2$

Adiponitrile is hydrogenated with Raney cobalt catalyst in liquid ammonia at 200 atm. with agitation. The crude hexamethylenediamine is redistilled to get a product with a melting point of approximately 41° C. The plant at Ludwigshafen had a capacity of 100 tons per month.

A new synthesis for making hexamethylenediamine from acetylene, formaldehyde, and hydrogen had been developed at the Leverkusen plant. It is based on the conversion of 1,4-butenediol, produced at Ludwigshafen by the Reppe synthesis, to 1,4-dicyanobutene-2 by reaction with anhydrous hydrogen cyanide in the presence of a liquid cuprous salt catalyst. The double bond in 1,4-dicyanobutene-2 is very reactive and readily adds diamines. For this reason it is necessary to reduce in two steps. The first stage to adiponitrile is accomplished with Raney nickel at 120° C. and 100 atm. hydrogen pressure. This is then hydrogenated directly to hexamethylenediamine with the usual cobalt catalyst. Overall laboratory yields are 70% 1,4-dicyanobutene-2 based on 1,4-butenediol and 80-85% hexamethylenediamine based on 1,4-dicyanobutene-2. It was claimed that under German conditions this would be a cheaper synthesis for hexamethylenediamine than the prevailing process from phenol via cyclohexanol and adipic acid.

ε-Aminocaprolactam

$CO\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}NH$

Caprolactam used to make Igamid B and Perlon L was produced at both Leuna and Ludwigshafen. Sulfur-free phenol was hydrogenated continuously to cyclohexanol, employing a nickel-aluminum oxide catalyst in a steel autoclave at 180° C. and 25 atm. pressure. The cyclohexanol was oxidized to cyclohexanone at 420° C. and atmospheric pressure with a metallic zinc catalyst containing 10% iron. The conversion of phenol to cyclohexanone was accomplished with 93% yield. The latter was converted to cyclohexanone-oxime which was rearranged by the Beckmann transformation into caprolactam. This rearrangement was conducted on a scale of 200 tons per month at Leuna and 150 at Ludwigshafen.

The raw materials used in the conversion of cyclohexanone to caprolactam are cyclohexanone, ammonia, sodium nitrate and sulfur dioxide. A 10 to 12% solution of ammonium nitrite is mixed at 0° C. with the equivalent quantity of an 80% ammonium bisulfite solution prepared from ammonia and sulfur dioxide. This is reacted with sulfur dioxide with

agitation, keeping the temperature below 0° C., until the reaction mixture is faintly acid, requiring about 5 hours. The resulting ammonium hydroxylamine disulfonate is warmed to 90° C. to hydrolyze it to hydroxylamine sulfate, ammonium sulfate and sulfuric acid. This mixture is cooled to 20° C. and the hydroxylamine sulfate solution is separated, pumped to the lead-lined oximation kettle and cooled to 20° C. A 5% molecular excess of cyclohexanone is added and ammonia is introduced with vigorous stirring until the reaction mixture becomes neutral. During this operation the temperature rises to 90° C. which is maintained to prevent solidification of the oxime. The crude oxime containing 4 to 5% water is run off continuously to the rearranger.

At Ludwigshafen caustic soda solution was used in the place of ammonia in making the hydroxylamine sulfate and the oxime, and the temperature of oximation was maintained below the melting point of the oxime (65 to 68° C.) to separate it as a crystalline solid. Fifteen hundred liters of saturated sodium bisulfite solution are added to 2000 l. of a 25% solution of sodium nitrite in water, keeping the temperature below 10° C. by cooling and stirring. The solution is then cooled to 0° C. and roaster gas containing 7 to 8% sulfur dioxide is fed in at 3° C. or below. The reaction giving the sodium salt of hydroxylamine disulfonic acid is complete when the pH reaches 3.5. The oxime is made by adding this solution to cyclohexanone, keeping the temperature below 50° C. and using about 470 kg. of hydroxylamine per 1200 kg. of cyclohexanone. Then a 40% aqueous sodium hydroxide solution is added slowly until the pH reached 3. The crystals of cyclohexanone oxime are filtered by suction and washed with water to remove Glauber's salt. The purer oxime thus obtained was said to be one of the factors in the better yield of caprolactam obtained at Ludwigshafen.

At Leuna the rearrangement is carried out continuously by adding 23% oleum and liquid oxime in the proportion 1:1 at a rate of 200 kg. per hr. into material which has already undergone rearrangement to serve as a diluent to prevent an explosive reaction. The composition of the reaction mixture should be such as to contain 55% sulfuric acid. The reaction is strongly exothermic and vigorous agitation and cooling are necessary to hold the temperature at 85 to 95° C. The contact time is approximately 2 hr. and the reaction volume is 1 cu. m. The crude caprolactam is siphoned continuously from the bottom of the rearranger to a stoneware neutralizer where it is neutralized with 13 to 14% ammonia. The temperature must not be allowed to rise above 40° C. The reaction mixture separates into 2 layers, an upper crude caprolactam layer containing 30% water and 60 to 65% caprolactam, and a lower layer of saturated aqueous ammonium sulfate solution, which is said to contain 3 to 5% caprolactam. The crude caprolactam is vacuum distilled twice in a 2 cu. m. stainless steel jacketed kettle, collecting the

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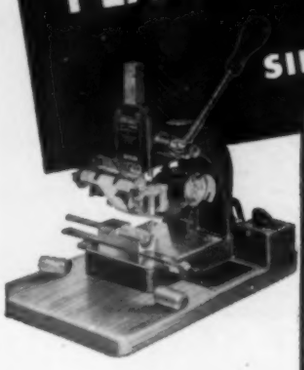

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caprolactam at 120° C. at 5 to 10 mm. pressure. A small amount of caustic soda is added for the second distillation. The yield of caprolactam was reported to be 80 to 83% based on cyclohexanone.

At Ludwigshafen the rate of feed to the rearranger is 200 kg. molten (80 to 85° C.) oxime containing about 8% water and 230-240 kg. oleum (24%), adjusting the amount for small variations in moisture content. Contact time is 15 to 30 min. and the temperature is maintained at 115 to 120° C. The crude caprolactam is siphoned off and neutralized with 35% sodium hydroxide solution. The upper aqueous caprolactam layer is removed and the water distilled at 60 to 100 mm. pressure. The caprolactam is treated with 1 to 2% sodium hydroxide and distilled at 4 mm. pressure, the main fraction being collected at 120 to 125° C. and redistilled. The plant is equipped with a flaking machine but the custom has been to dissolve the molten material directly in water to give an 80% solution of caprolactam which was sent to the polymerizers. The yield of caprolactam (m.p. 69° C.) was reported to be 85 to 92% based on cyclohexanone.

The better yield at Ludwigshafen than at Leuna was said to be attributable to the use of a purer oxime, the higher temperature employed for the Beckmann rearrangement, a more efficient control of temperature during the rearrangement by proper stirring and cooling equipment, and the lower solubility of caprolactam in aqueous sodium sulfate as compared with aqueous ammonium sulfate.

Caprolactam is also available from purely aliphatic sources by the Reppe alkynol synthesis. If only 1 mol of carbon monoxide is introduced into tetrahydrofuran, δ-valerolactone is formed, which by reaction with sodium cyanide is converted into δ-cyanovaleric acid. Hydrogenation of the latter yields caprolactam. It can also be synthesized from propargyl alcohol as follows: propargyl alcohol→ hexadiyne-2,4-diol-1,6 → caprolactone→ caprolactam.[3]

Ketopimelic acid

$$HOOC\text{-}CH_2\text{-}CH_2\text{-}CO\text{-}CH_2\text{-}CH_2\text{-}COOH$$

Ketopimelic acid is produced by decarboxylation of two molecules of succinic acid to yield ketopimelic dianhydride, followed by ring opening. The process consists in heating 90 parts succinic acid with 150 parts solvent to 250° C. for 3 to 5 hr. until evolution of water and carbon dioxide has ceased. Solvent and unchanged succinic anhydride are distilled off rapidly from a high-pressure steam-jacketed pan, using no column and a wide diameter neck. Ketopimelic dianhydride remains behind in the pan and will solidify on cooling. It is treated with 5 parts boiling water for several hours, cooled, filtered, washed and dried. The yield is 70% ketopimelic acid with 80% conversion per batch.The plant at Ludwigshafen had a capacity of 5 tons per month.

The most suitable solvent has not yet been

[3] See Table IV, MODERN PLASTICS 23, 176 (Feb. 1946).

definitely settled. Most work has been conducted with technical methylnaphthalene, although chloronaphthalene and diphenylenemethane (fluorene) have also been used. The addition of 10% of paraffin wax (m.p. 50° C.) increases the temperature at which the reaction can be conducted and gives better yields.

Another possible method for the production of ketopimelic acid is the reaction of nitromethane and acrylic acid to yield nitromethyl-tri-β-propionic acid which is then treated with alkali.

p,p'-Diaminodicyclohexylmethane

$H_2N\text{-}C_6H_{10}\text{-}CH_2\text{-}C_6H_{10}\text{-}NH_2$

Two mols of aniline are condensed with 1 mol of formaldehyde to make diaminodiphenylmethane. It is hydrogenated with 5% cobalt oxide catalyst in the presence of sodium carbonate and calcium carbonate (chalk) at 200 atm. hydrogen pressure and 140° C. The yield of distilled product is about 85 percent.

Pimelic acid

$HOOC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$

This acid is produced at Ludwigshafen by addition of acrylonitrile to butadiene to yield tetrahydrobenzonitrile which is subjected to a 30% concentration caustic alkali melt under pressure at 250-280° C. Pimelic acid can also be produced by reduction, splitting and saponification of methyl salicylate.

The synthesis of pimelic acid from tetrahydropyran, carbon monoxide and water, comparable to the production of adipic acid from tetrahydrofuran is another possibility. Alternately, tetrahydropyran can be converted into 1,5-dichloropentane, then reacted with hydrogen cyanide to yield pimelonitrile, and thence to pimelic acid.

Succinic acid

$HOOC\text{-}CH_2\text{-}CH_2\text{-}COOH$

This acid, which is used in the production of ketopimelic acid, is made by oxidation of tetrahydrofuran with nitric acid at 20 to 30° C. It is converted to the anhydride by vaporizing the acid in vacuo at 100 mm. Hg. and passing the vapors over aluminum catalyst at 300° C.

Sebacic acid

$HOOC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$

This acid is made at Leuna by electrolysis of sodium monomethyl adipate, using a 15 to 20% concentration in methanol at reflux temperature (70° C.). Carbon dioxide is split from the monomethyl adipate ion at the anode and 2 mols of the remaining ion combine to form dimethyl sebacate. The dimethyl sebacate is extracted continuously with a hydrocarbon solvent and the half ester is continuously fed into the cell at the neighborhood of the cathode. Platinum anodes are essential in the cell construction. For a production of 10 tons per month of sebacic acid it was estimated that it would cost double the price of adipic acid. (*Turn to next page*)

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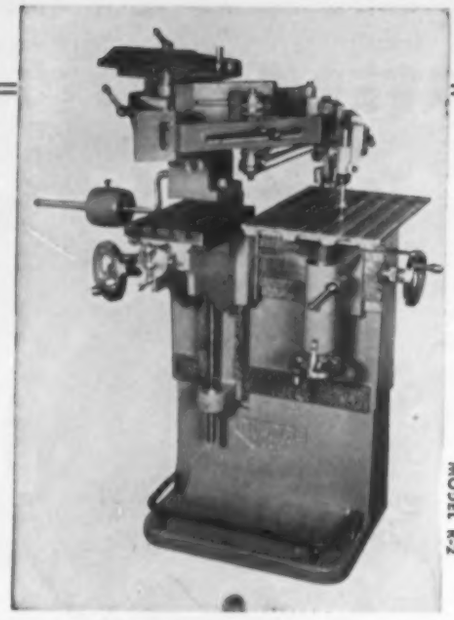

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This process had been worked out on a laboratory scale in Germany because there was no supply of castor oil which would be a cheaper source of sebacic acid. The action of alkali on castor oil yields sodium ricinoleate which by pyrolytic decomposition with sodium hydroxide splits into capryl alcohol and sodium sebacate.

p-Phenylene dipropionic acid

$$HOOC\text{-}CH_2\text{-}CH_2\text{-}C_6H_4\text{-}CH_2\text{-}CH_2\text{-}COOH$$

This acid was made by converting *p*-dichloromethyl phenylene to terephthalaldehyde, thence to *p*-phenylene diacrylic acid, and finally to *p*-phenylene dipropionic acid. Other syntheses had been explored but without success. About 200 kg. had been made for development work, and it had been the intention to make a further 2000 to 4000 kg. but this was prevented by bombing.

Suberic acid

$$HOOC\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$$

This 8-carbon dicarboxylic acid has become available as a result of the Reppe synthesis of cyclooctatetraene by polymerization of 4 mols of acetylene. The reaction is carried out in a solvent, tetrahydrofuran, containing nickel cyanide as catalyst. The solvent is freed of oxygen by passing nitrogen through it and is heated to 60 to 80° C. under a nitrogen pressure of 5 atm. Acetylene under 20 to 25 atm. pressure is then admitted at intervals, polymerization as an exothermic reaction beginning at once. The pressure is kept between 5 and 10 atm. by acetylene additions during approximately 30 hr. until the catalyst is exhausted. Nickel salts and cuprene form during the reaction and settle out. The tetrahydrofuran solution is filtered and distilled. The tetrahydrofuran distills at 65° C. and the cyclooctatetraene fraction at 142 to 143° C. at 760 mm. pressure. The yield is 90 percent.

Hydrogenation of cyclooctatetraene over platinum or nickel catalyst yields cyclooctane. Nitric acid oxidation of cyclooctane forms suberic acid. Better yields of suberic acid can be obtained by oxidation of cyclooctatetraene with perbenzoic acid in chloroform solution to 1,2-epoxycyclooctatriene-3,5,7, followed by hydrogenation to cyclooctanol and nitric acid oxidation.

Other dicarboxylic acids

γ-Butyrolactone, $\underline{O\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CO}$,

which is easily and cheaply obtainable by the alkynol synthesis through dehydrogenation of 1,4-butanediol in practically quantitative yields, can be split by alkalies or strongly alkaline-reacting compounds to form dicarboxylic acids or their intermediates. For example, butyrolactone treated with sodium hydroxide at 180 to 200° C. gives sodium γ-hydroxybutyrate which loses water intermolecularly under the influence of dehydrating catalysts, such as alumina, giving the disodium salt of oxydibutyric acid. The

yield is 80 to 90%; the melting point of oxydibutyric acid is 81° C.

Similarly, through reaction of butyrolactone with sodium cyanide, cyanobutyric acid is obtained, which can be converted by saponification into glutaric acid; with sodium sulfide, thiodibutyric acid is produced; and with sodium disulfide, dithiodibutyric acid is obtained. Thiodibutyric acid upon oxidation yields sulfonyldibutyric acid; the simplest way to do this is with chlorine in aqueous solution.

Tetramethylenediamine

$H_2N\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}NH_2$

This diamine was being produced experimentally at Leverkusen by the reaction of acetylene and hydrogen cyanide to yield acrylonitrile which was converted to succinonitrile and thence to tetramethylenediamine. Following the appearance of the American patents to Nieuwland and others covering the addition of hydrochloric acid to acetylene, the I. G. substituted hydrogen cyanide for the hydrochloric acid but otherwise used the same types and amounts of catalyst to obtain acrylonitrile. To prepare the succinonitrile, a mixture of 4 kg. of crude succinonitrile and 80 grams of potassium cyanide are charged to a closed kettle provided with an agitator. Over a period of 3 to 4 hr., 13.26 l. acrylonitrile and 9.72 l. anhydrous hydrogen cyanide are added at 40 to 55° C. and stirred for a further hour. Addition is practically instantaneous. Pure succinonitrile is obtained in 90 to 95% yield by vacuum distillation of the crude product.

Hydrogenation to tetramethylenediamine is accomplished by treating 3000 grams succinonitrile, 7 l. tetrahydrofuran, 1500 grams anhydrous ammonia, 100 grams Raney cobalt catalyst, and 100 grams calcined chalk at 120 to 140° C. under 200 atm. hydrogen pressure. After filtering and fractionally distilling, 2400 grams tetramethylenediamine (72.5% theory) is obtained together with 18% pyrrolidine and 9% higher boiling fraction. Dr. Bayer claimed that the diamine made by this process would cost half as much as hexamethylenediamine.

Pentamethylenediamine

$H_2N\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}NH_2$

This diamine is one of the compounds made available by the Reppe synthesis. 2-Butynediol-1,4 produced by the combination of 2 mols of formaldehyde and 1 mol of acetylene is hydrogenated to 1,4-butanediol; this is followed by conversion to γ-butyrolactone, reaction with alkali cyanide to form glutarimide, treatment with ammonia to give glutaronitrile and reduction to pentamethylenediamine. Batchwise reduction of glutaronitrile with Raney cobalt at 80 to 100° C. gives 62% pentamethylenediamine and 34% piperidine. Reduction in solvents gives 10% diamine and 85% piperidine. Continuous hydrogenation gives 87% pentamethylenediamine and 8% piperidine.

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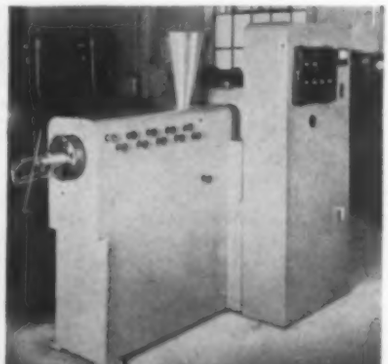

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Electrical Switchgear

(*Continued from page* 114)

Figure 8 shows some of the intricate shapes of the insulating parts used in the larger types. Mica is sometimes used where extreme heat is present.

Electrical characteristics tests

As in the case of the non-molded insulation parts, choosing of the proper compound to use for the various molded parts is an important factor for the proper operation of the circuit-breaker. Usually, the manufacturer's data as to the mechanical properties of the compound are sufficient but it is often necessary for the user to establish his own data for the electrical properties. The four principal electrical characteristics for which comparative tests are made are, in order of their importance: 1) arc tracking, 2) dielectric strength, 3) arc resistance, 4) burning.

To determine the "arc tracking" characteristic, sample disks ⅛ in. thick made of the compound to be tested are subjected to a 4000-volt, 65-milliampere alternating current arc. The test consists of establishing an arc between two steel electrodes. After the surface directly under the arc carbonizes, one of the electrodes is drawn away from the other along the surface. Data are taken as to initial breakdown time of the surface, rate of speed at which the electrode can be moved, and once a carbonized path has been made, whether the path has low resistance.

Generally speaking, all phenol-resin materials show up very poorly on this "arc tracking" test, whereas the urea and melamine resins show up the best of those resins which can be used in circuit-breaker molded parts. Unfortunately, the ureas will not withstand some of the high temperatures attained in normal circuit-breaker operation and so their use is rather limited.

In the circuit-breakers being considered here, it is sometimes found desirable to spray the inside of the molded base and cover with an insulating paint or varnish to increase the "arc tracking" characteristic of the material.

Dielectric strength

Usually the dielectric strength of any of the presently available materials is of sufficient value since the wall thicknesses are determined by the mechanical strength required. The dielectric strength of the material is determined by the ASTM test method D149-44 except that the test is conducted in air.

The arc resistance test is made in accordance with the ASTM method D495-42. Unfortunately, this method does not give the true characteristic of the material for switchgear applications. There is a need for a new method for determining this characteristic. The prime consideration must be that the voltage

be constant at some predetermined current value.

The last of these comparative tests, the burning test, mostly applies to switchgear for Navy shipboard service. Strangely enough, it has been found that a material which has a good "arc tracking" characteristic also has a good flame resistant characteristic. The melamine resins fall in this category and therefore many of the plastics parts for shipboard use were made of these resins.

Much has been written about the electrical properties of silicone-resins. The I-T-E Circuit Breaker Co. has tested many sample parts, both laminated and molded, which were made of silicone-resins, to determine their usefulness in switchgear designs. To date, the firm has found silicone-resins generally unsatisfactory as compared to melamine-resin materials. They are only slightly better than the phenol-resin materials which are not considered satisfactory for shipboard use. At the present time, silicone-resin is combustible at about 400° C. Thus these materials, irrespective of their filler, will aid a fire once it has started.

It was also found that this material, although it had a good arc resistance characteristic, did not show up so well on the "arc tracking" test. Since this resin is in its infancy, it would be unfair to predict that it has little future possibilities for use in switchgear applications. Future developments may make it an ideal material to use but in its present state it does not meet the requirements. In addition to its faults in electrical properties, the cost of silicone-resin is so high its use is prohibitive in commercial switchgear.

Approaching the ideal

Melamine-resin materials more nearly approach the ideal types of material for switchgear applications. They do not track easily, are very hard to burn irrespective of the filler used, and have good mechanical and dielectric strength properties. At the present time, the relatively high cost of melamine-resin, as compared to phenol-resin, limits its use on commercial applications. As manufacturing costs of these compounds become less, more and more of them will be used in molded and laminated parts for all types of electrical apparatus.

Phenol-resin materials are more widely used in switchgear because of their economics. The low cost of the phenol-resin materials, even though added precautions may have to be taken to increase the electrical properties, makes it a universal material for all types of electrical apparatus. The principal undesirable characteristic of phenol-resin materials for commercial applications is its poor resistance to "arc tracking." If this characteristic can be improved, use of the materials will continue at its present rate.

Summary

The melamine-resin materials are the best all around materials for electrical applications but there

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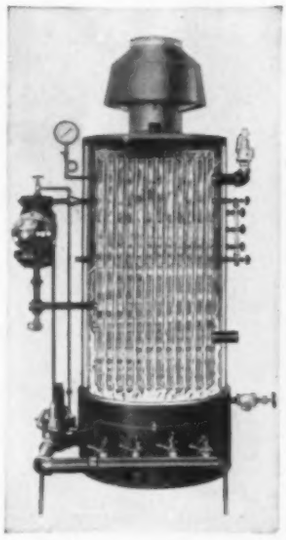

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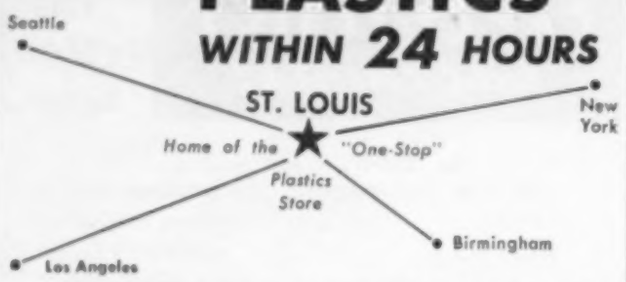

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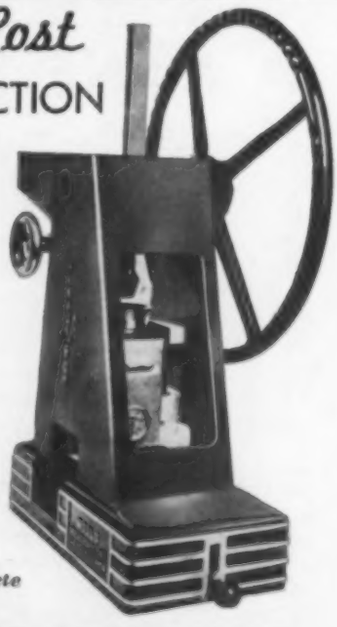

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are still many desirable improvements which should be made. Principal among these would be a modification of the resin so that laminated sheets can be post-formed without cracking the surface. Tests are at present being made on newer types of resins and it is hoped that these tests will reveal a low-cost material which has all the desired characteristics.

Dielectric fatigue

(*Continued from page* 124)

minutes. Such questions cannot be definitely answered until further testing is carried out.

The general behavior illustrated in Figs. 1 through 6 may be associated with the fact that the alternating field generates heat within the sample in accordance with the principles of dielectric heating. The rate of heat production may be expressed as follows:

$$P = CV^2 \omega k \tan \Delta$$

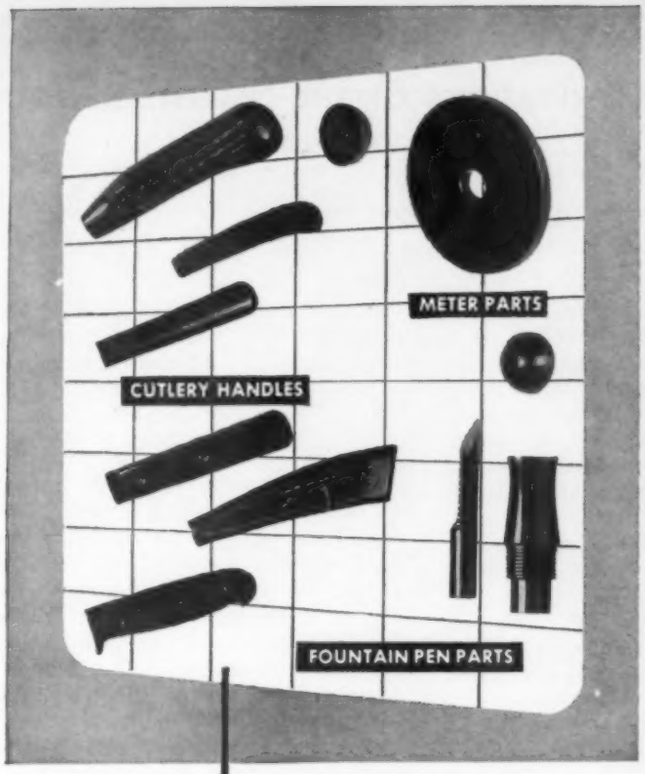
where V is the applied voltage, ω is 2π times the frequency, k tan Δ is the loss factor of the material, and C is a proportionality factor which includes form factors. Thus, for a given voltage, the initial rapid rate of temperature rise decreases with time as greater quantities of heat are lost to the surroundings. Eventually an equilibrium point is reached where the rate at which heat is lost is equal to the rate of internal heat production. At this higher equilibrium temperature less voltage is required for dielectric breakdown because the greater thermal agitation (on a molecular scale) increases the ease with which ions or other charge carrier may be dislodged and accelerated in sufficient quantities to lead to the "charge avalanche" of breakdown.

Although the above explanation is a helpful one, and certainly plays an important role in dielectric fatigue, it is unable to explain certain facts. For example, it can not account for the fact that polystyrene appears to exhibit about the same percentage of fatigue to short-time strength as do other materials with much higher power factors. Thus, the rate of heat production in polystyrene should be only about one-hundredth as great as that in Resinox 4216 or in cellulose acetate.

It is suggested that any slight traces of ionic materials and also any small scale voids or discontinuities which may be present play an important part in the breakdown of low power factor materials like polystyrene as well as in that of higher power factor materials where internal heating is also important.

Acknowledgment

The experimental work described above was done at the Springfield Research Laboratory of Monsanto Chemical Co. Mr. R. D. Dunlop encouraged the authors to complete and publish the work.



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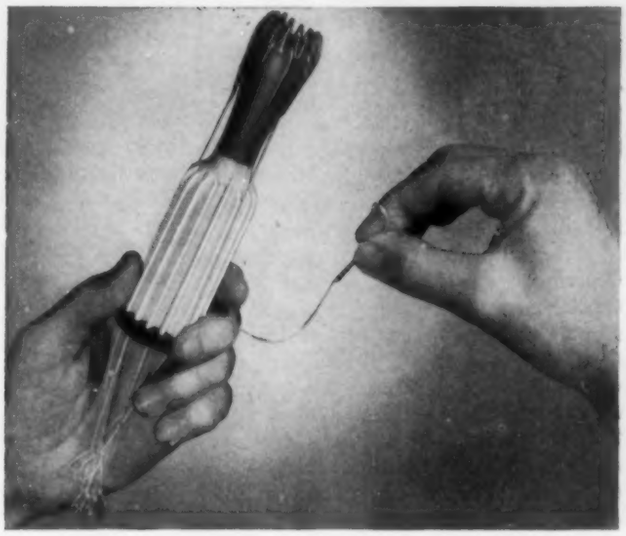

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HOOK PAK is another case history showing how Newark Die Company serves the plastic industry. If you have a production problem requiring multiple cavity molds, perhaps we can help you. More than 25 years' experience in producing thousands of compression, transfer, and injection type molds qualifies us to turn out the hobs, hobbed cavities, and machined molds you need.

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THE PLASTISCOPE*

INTERPRETATIONS OF THE CURRENT NEWS

By R. L. VAN BOSKIRK

Raw material exports

Something like 6,000,000 lb. of phenol were exported in the last quarter of 1947, and approximately the same amount is planned for the first quarter of 1948, according to Washington authorities. Total export of phenol for 1947 was close to 19,000,000 pounds. Practically all of it is being shipped to England and Belgium. This is the full amount of phenol permitted under the export control arrangement. It does not include the phenol exported to Canada, which country in 1947 received 30% of the phenol exported by the United States, according to Washington information.

The phenol which has been exported was going out of the country at an average cost of from 20 to 25¢ a lb., in comparison with the 12 to 15¢ at which it was selling domestically in the latter part of 1947. None of the important manufacturers of phenol are exporting, except to their own plants located in foreign countries—the exported material supposedly goes through other channels, and ugly rumors have been printed to the effect that several small companies who are ordinarily small users of phenol have now become exporters on a fairly large scale. The export quota is set up by a Government committee and may be altered from quarter to quarter.

Molding powder—In addition to phenol, the quota for phenolic molding powder is 10,000,000 lb. a quarter, and 5,000,000 lb. is the quota for protective coatings. In addition, there is a quota of 800,000 lb. of phenolic laminating varnish and 600,000 lb. of resin. Government authorities do not believe that this quota would undergo much change under the Marshall Plan, except that the quotas might be set by country instead of as a broad over-all figure.

Another raw material of interest to plastics under export control was naphthalene, but the quota for an entire quarter is only 450,000 lb., and it is doubtful that foreign shipments even approach this figure.

*Reg. U. S. Patent Office.

Benzol exports—The quota for benzol is 1,500,000 gal. a quarter, with actual exports probably under 1,000,000 gallons. This, of course, does not include Canada, and the quota is smaller than the amount of benzol that was exported in the pre-war period. Reportedly there is no gray market in this material, which was going out at the end of the year at prices of from 30 to 32¢ in drums, most of it to France. Before the war, benzol exports, exclusive of Canada, were 14,000,000 gal. in 1935; 19,000,000 in 1936; 20,000,000 in 1937; and 10,000,000 in 1938.

Urea was not under control because there probably was not enough in production to permit export and no facilities in the Government to control it. A fairly sizeable amount was imported into this country from the French zone of Germany at a price of from 9 to 10¢ per lb. shortly after V-J Day.

Export of finished plastic materials such as cellulose acetate, polystyrene, and vinyl chloride, had reached sizeable export figures of a combined total of over 40,000,000 lb. through the first nine months of 1947, but exports fell off tremendously after that period because of the dollar shortage.

MODERN PLASTICS
Joins A.B.P.

It is with an increased sense of its responsibility as a reporter and interpreter of progress in the plastics industry that MODERN PLASTICS announces that it has accepted membership in the Associated Business Papers organization. This national association, founded in 1916 to set standards—editorial, circulation, and advertising—for business paper publishing, has grown to a membership today of over 130. Of these, MODERN PLASTICS is the only publication in its field which now holds membership in both the A.B.P. and Audit Bureau of Circulation.

Vinyl tubing

An extruded vinyl tubing, known as Natvar #400, is reported to be the first extruded plastic tubing to be approved by Underwriters' Laboratories for use in internal wiring of electrical equipment where the acceptability of the combination has been determined by Underwriters' Laboratories, Inc. The tubing, manufactured by the National Varnished Products Corp., Woodbridge, N. J., can be used for continuous operating temperatures as high as 105° C.

The new vinyl tubing is readily distinguished from other tubing by four ridges which are equally spaced around the circumference and run the length of the tubing. According to the Underwriters' report, all sizes of the tubing are not to be used as sole insulation except as provided for by the Underwriters. For example, Natvar #400 tubing with an average wall thickness of 0.016 to 0.020 in. and a maximum minus tolerance of 0.003 in. can be used for insulation at a maximum voltage of 300. Other wall thicknesses with stated tolerances can be used as voltages up to 600.

In regard to flame-retardant properties, the Underwriters' report states that when samples were subjected to standard tests established for thermoplastic insulated wires, there was no burning of the indicator and no burning after the fifth application of the flame.

In uses where coated fabric sleeving and tubing have heretofore been required, there should be worthwhile savings in material, labor, and waste. The material is particularly suitable where the operating conditions call for both oil resistance and high heat resistance, according to the producers.

Vinyl acetate

Polymerization of vinyl acetate as practiced in two leading German plants is described in a technical report now on sale by the Office of

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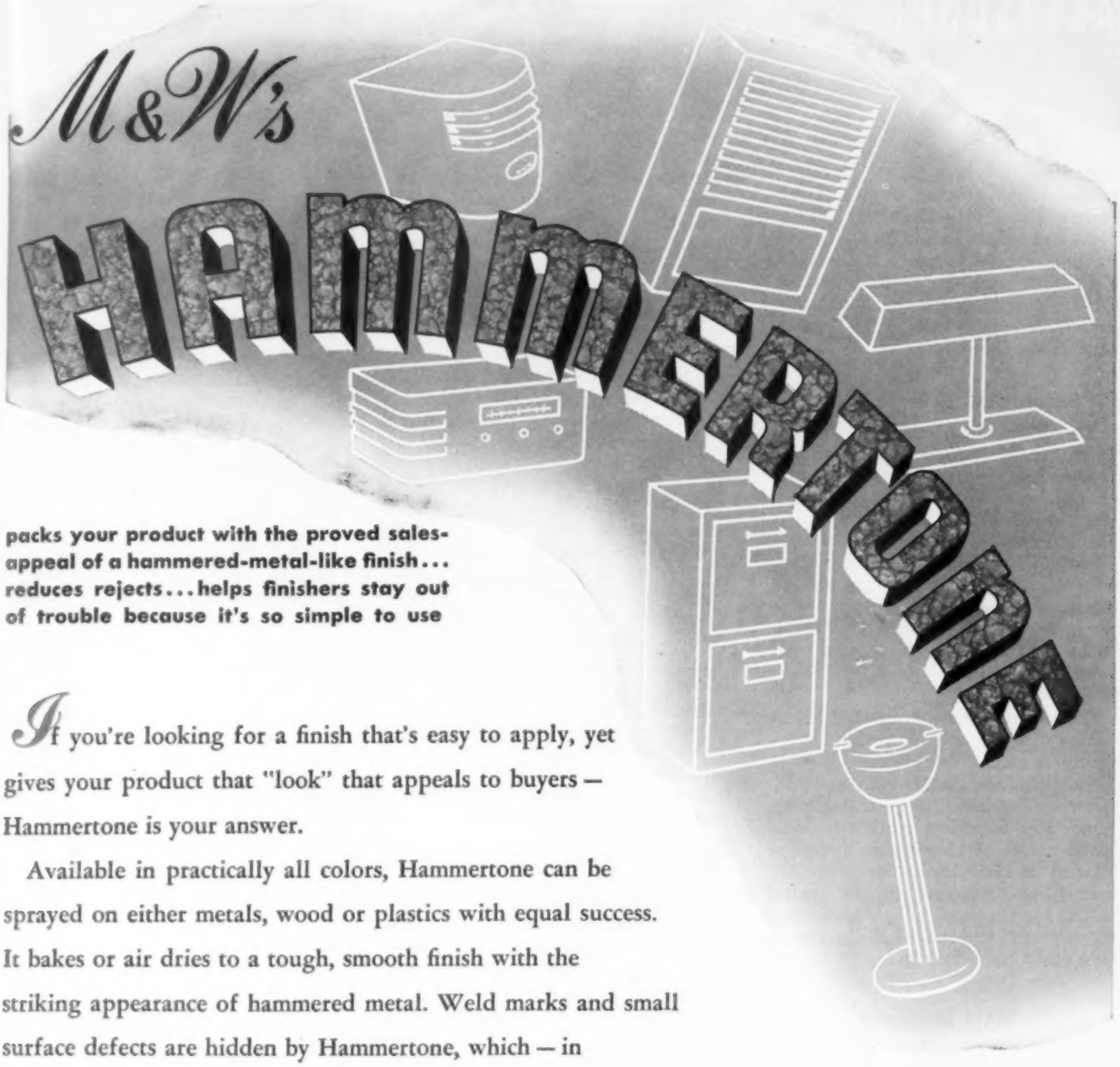

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Technical Services, Dept. of Commerce. Mimeographed copies of the report (PB-78741—52 pages) sell for $1.50 and orders should be addressed to the Dept. of Commerce, Office of Technical Services, Washington 25, D. C., accompanied by check or money order payable to the Treasurer of the United States.

Saran now generic word

The Dow Chemical Co., Midland, Mich., has formally released its trademark rights to the name "saran," permitting it to become the descriptive name of the product. Donald L. Gibb, manager of the Plastics Sales Div. of Dow Chemical, said the action was taken "in the interest of simplifying identification of various plastic materials whose chemical names have for years been confusing to press, trade, and consumer alike."

The term "saran" applies to a series of thermoplastic resins chemically known as vinylidene chloride copolymers, originally developed by Dow in the latter 1930s and known especially for their resistance to a wide range of chemicals. Monofilaments of the plastic are currently becoming prominent in the textile field. Moisture repellent packaging films and corrosion resistant piping are other important uses.

Vinyl problems

It is no longer news that the vinyl branch of the plastics industry has expanded on a quantity basis more than any other plastic since the end of the war, but the job of expanding hasn't been all fun. Scores of would-be vinyl processors have come into the field and been wiped out since the war's end. Careful research and development men, as well as sales promotion experts, are convinced that the industry is well started towards substantial and ever-increasing quantity production but, like any other important industry, there are hurdles to overcome. In an attempt to point out these particular problems that are now confronting the industry, MODERN PLASTICS made a mail survey of the vinyl industry and specifically asked for the opinion of each processor on what he thought was the most important problem confronting the vinyl film and coating industry. Here are the answers:

Maintenance of quality in a highly competitive market.
Market development and better merchandising plans.
Cost of materials and finished product in comparison to many competitive items.
Concentration on the most satisfactory products to be made from vinyl.
Need for better primary plasticizer in sufficient quantities with wide temperature ranges which will result in better hand, life, and quality.
Plasticizer migration with particular emphasis on effect on lacquer, resin, and rubber surfaces.
Plasticizer loss on washing with soap.
Elimination of odor.
Uniformity of raw materials.
More suitable dyes and pigments with possible standardization of colors and shades.
Adhesion to other materials.
Adaptation of equipment and improving processes to keep up with chemical advances.

To offset these problems, we also asked the processors to give their opinion of the outstanding developments in 1947. Their answers are as follows and are listed according to the number of mentions received for each item:

Increasing use of pastes, emulsions, organasols, and plastisols.
Improved stabilizers.
Increased quality-consciousness of processors.
Progress in solid plasticizers.
Development of thin films from pastes, organasols, etc.
Better printing, embossing, and top dressing.
Development of nitrile rubber-vinyl combinations.
Wide width multicolor rotogravure sheeting.

Micarta-plywood laminate

Decorative Micarta, backed with plywood in thicknesses of ¾ and 1⅛ in. will be made available early this year by the Micarta Div. of United States Plywood Corp. The decorative Micarta, made by the Westinghouse Electric Corp. and distributed by United States Plywood Corp., can be used by the cabinet maker or amateur carpenter in the same way as wood in making tables and other furniture. Legs can be set into the under side of a sheet as in ordinary cabinet-making procedures, and attached by means of brackets. This eliminates the gluing operation the unbacked laminate requires.

Decorative Micarta is used for counter surfaces and for kitchen and bathroom walls in homes. It provides acid resistant, moistureproof, cigaretteproof, and stainless surfaces in industrial plants and elsewhere.

Large acrylic sheet

A larger size acrylic sheet than ever before produced is now beyond the development stage and available for commercial production by Rohm and Haas Co. The new sheet will be 100 by 120 in. in comparison to the present largest size of 67 by 79 inches. The new size will be particularly applicable for such uses as transparent sheeting in military aircraft, and possibly as tops for convertible automobile models. Signs and spectacles and uses in the fields of merchandising and architecture are other prospects.

New golf ball

Silicone "bouncing putty"—and an electronic thread winding device—will be used in the production of a new golf ball announced by United States Rubber Co. The silicone will be put into the center of the ball to give it improved distance, "click," and "feel." The electronic device will control the tension of the thread wound around the center, making all balls uniform in playing performance.

The silicone center in the new golf ball is about the size of a large pea. This center is under constant pressure of about 2,500 p.s.i.

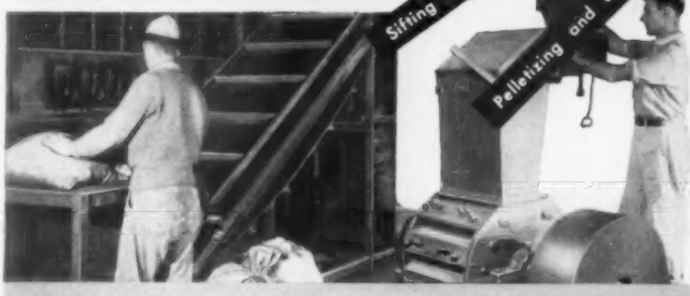
Plexene price reduced

Prices on Plexene were recently reduced from 63¢ per lb. in large quantities to 55¢ for colored and 54¢ for natural, according to an announcement by Rohm and Haas Co.

Synthetic phenol manufacture

The know-how on the Raschig process for manufacturing synthetic phenol is now available to licensees of the process from the Office of Alien Property, Dept. of Justice. The data cover scientific, technical, economic, and patent information relating to the process. Licenses for using the Raschig process have been made available to American business on a royalty-free, non-exclusive basis for an administrative fee of $15. The know-how is available to licensees who agree to pay the cost of photostating any of it they desire to use. It

SCRAP AND VIRGIN Plastics



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THE PLASTISCOPE

may be inspected upon application at the Office of Alien Property, Dept. of Justice, Washington 25, D. C.

Thermoplastic papers

A new delayed action thermoplastic paper called Thermo-Kote has been developed by the Nashua Gummed and Coated Paper Co. Thermo-Kote is activated first by heat and then applied under pressure, in contrast to former heat sealing paper or tape which could only be activated and applied by simultaneous use of heat and pressure.

Thermo-Kote is being tried out on many diversified products from ampoules to X-ray plates. Because the separation of heat and pressure requirements by a time interval of several seconds or even minutes is possible with the use of Thermo-Kote, the material has distinct advantages for both machine designer and labeler. It also has the advantage of activating within definite temperature ranges, which means that Thermo-Kote does not block under normal storage or plant conditions where temperatures do not exceed 125° F. Developers recommend activation temperatures between 200 and 275° F. Recommended pressures are between 5 and 30 p.s.i.

S.P.E. elects new officers

At the annual meeting of the Society of Plastics Enginers, Inc., the following slate of officers was elected for 1948: J. H. DuBois, Shaw Insulator Co., Irvington, N. Y., president; Mario Petretti, Noma Electric Co., Springfield, Mass., vice-president; R. G. Dailey, Wolverine Plastics, Inc., Milan, Mich., secretary; and Richard B. Bishop, Socony Vacuum Oil Co., Paulsboro, N. J., treasurer.

Sink and counter tops

A group of plastics engineers has organized as a Plastics Technical Sub-Committee of the Standardization and Simplification Committee functioning under the Sink and Counter Top Manufacturers' Institute, with D. J. O'Conor, Jr., of the Formica Insulation Co. as chairman. The goal of the group, stated Mr. O'Conor, is geared to the over-all objective of the Institute's Standardization and Simplification Committee: to provide architects, contractors, and consumers alike with a factory-made product of lasting quality, certified by passing a series of tests to determine durability and resistance to water and moisture, stains, heat, abrasion, and impact. Consumer education to stress correct use and care of laminated tops on kitchen equipment has also been considered as an ultimate objective.

Blended plastics

A new, sparkling, flame-resistant plastic that can be blended with other material to increase the beauty and utility of many everyday plastics was announced by the Victor Chemical Works, Chicago, Ill., at a recent technical conference of the Chicago Section of the American Chemical Society. The new plastic, called DABP, is unusually hard and transparent, according to Lee V. Brown and Arthur D. F. Toy of Victor, who added that although it burns when held in a flame, the material quickly extinguishes itself when withdrawn. The DABP is said to imbue blended plastics with these desirable characteristics and also makes them lustrous and invulnerable to attack by common chemical solvents.

Glass laminate—One material made with the blended plastics is a strong, semi-transparent laminate with glass cloth, in which the plastic and glass fibers are bound in layers like plywood, the chemists reported.

DABP is manufactured from a complex liquid chemical, diallyl benzenephosphonate, by a process involving a catalyst and carefully controlled heat, according to the Victor representatives. They further stated that considerable success has been obtained by blending DABP with methyl methacrylate and vinyl acetate, explaining that the compounds must be blended in the liquid state and then hardened by heat. The mixed plastics are transparent, with colors ranging from water white to a light amber, and they are unaffected by such common chemicals as gasoline, weak acids and alkalis, water, and some cleaning fluids, and retain their hardness and luster under prolonged exposure to relatively high heat.

Foreign chemical developments

A book covering chemical developments in most of the European countries and the British Commonwealth, has been published by the Office of International Trade, U. S. Dept. of Commerce. It resumes the series of annual reviews of chemical developments throughout the world issued from 1933 to 1939 and discontinued during the war. The booklet, entitled "World Chemical Developments, 1940-46, Part I," is available from the Superintendent of Documents, Washington 25, D. C., for 30 cents.

Plastic in interior decoration

The use of plastics in hotel interior decoration has recently shown a marked increase. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced that the latest of hotels to employ decorative Lucite acrylic resin is the Traymore Hotel in Atlantic City. This transparent plastic lends itself readily to bar and lobby decorations and decorative accessories, and the Traymore Hotel has recently installed acrylic lamps, room numbers, elevator signs, decorative murals, bar signs, smoking tables, and waste baskets. Also, for the dining room, the Traymore has acquired a large number of bowls, serving trays, and individual flower vases of the same material for the tables. This particular line of plastic items is fabricated by Almac Plastics, Inc., New York, N. Y., which specializes in hotel decorative pieces.

Plastics at boat show

Molded plastic boats were shown by at least two companies at the 38th National Motor Boat Show at New York's Grand Central Palace in January, and seemed to meet the taste of the public. The Winner Manufacturing Co. offered Plasticraft vessels from 10 to 14 ft. at prices of $185 to $395. The Beetle Boat Co. showed three small sailboats of glass fiber, molded by General Electric, costing $249 to about $700 with rig and accessories. Beetle claims an 80% saving in hull maintenance for the owners. They think 1948 prospects are good.

Wall tile meeting

A progress report on the proposed polystyrene wall tile standard was recently delivered by C. J. Poiesz of the United States Bureau of Standards to a Wall Tile Manufacturers Institute gathering in Pittsburgh. Mr. Poiesz stated the Bureau of Standards was endeavoring to develop two tests to be incorporated in the specification: one to evaluate the

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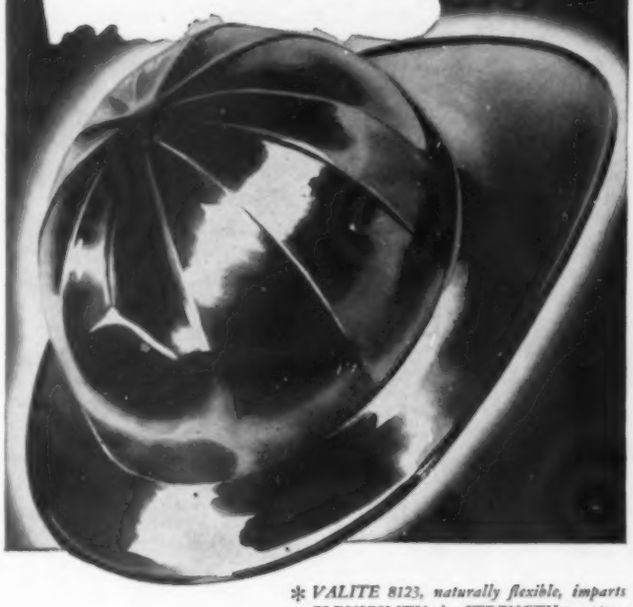

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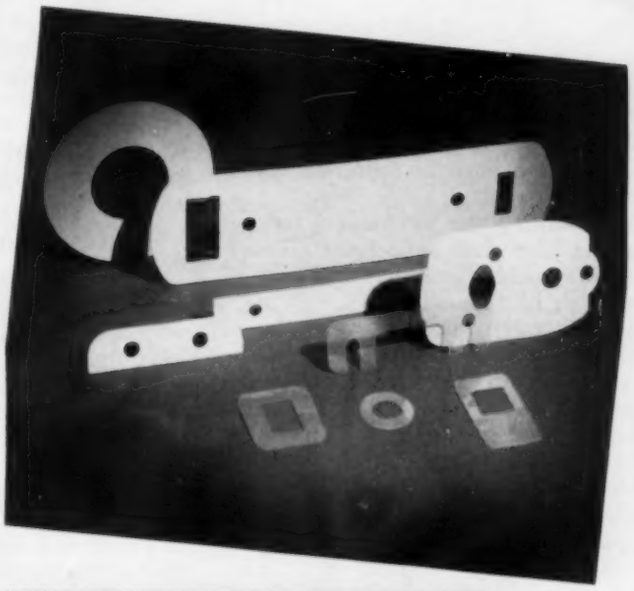

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strength of tile, the other relating to its opacity and light transmission characteristics. In order to continue the investigation, the Bureau of Standards wants the following types of tile samples:

A quantity for mechanical testing of: a) tiles that have been molded on a short cycle which will fail in service; b) tiles which may or may not fail; and c) tiles which have been properly molded that will not fail.

2. A quantity for light transmission testing of: a) tiles which are definitely too translucent to be useable; b) tiles which may or may not be too translucent to be useable; and c) tiles which are definitely sufficiently opaque to be suitable.

Any company wishing to send in samples is invited to do so. About 24 of each sub class should be sufficient. Mark them to indicate which type they are. Those tiles are to be used for the purpose of developing tests only. Address them to: Mr. C. J. Poiesz, project engineer, National Bureau of Standards, Washington 25, D. C.

Mr. Poiesz would also like to hear from molders and their tile trade outlets on the types of surfaces to which tile is most commonly applied, i.e. rough or smooth plaster, plywood, wallboard, etc.

More plastics in trains

A new streamlined train, the City of Kansas City, put into service on the Wabash Railroad recently, features several plastics applications. One of these is in partitions between the lounge and the dining room where six Lucite rods are spaced 6 in. on centers and interlaced with leather. The rods show a rosy luminous glow originating from lamps in the base of the partition.

Rayon name dropped

Announcement that it has discontinued use of the word "rayon" as a generic name for its cellulose acetate textile fibers and the products manufactured from them, has been made by Tennessee Eastman Corp. James C. White, president and general manager, said the step had been taken because "two very different textile fibers are now being offered to the public as rayon"—one known chemically as viscose, or regenerated cellulose, and the other as cellulose acetate.

Tennessee Eastman's decision is a direct challenge to the Federal Trade Commission ruling which has been in effect more than 10 years. The rule adopted in 1937 makes it mandatory for a manufacturer of either regenerated cellulose or acetate cellulose to use the name "rayon." The use of the words "cellulose acetate" or "viscose" in addition to "rayon" is optional with the manufacturer.

Sour milk

Research workers at the United States Dept. of Agriculture's Eastern Regional Research Laboratory assert that plasticizers for vinyl can now be produced from lactic acid, the chemical which gives sour milk its characteristic taste.

RAW MATERIALS

Three new members of the Geon 200 series resins are now available from B. F. Goodrich Chemical Co., Cleveland, Ohio. Geon resins 204 and 205 are in commercial production, with Geon resin 200 x 14 available in experimental quantities. The new materials offer increased thermoplasticity and lowering of softening point, plus greater solubility, according to the developers.

Their good solubility makes these resins useful in the solution coating field. Because of their improved thermoplasticity, they process at much lower temperatures than the older Geon resins 202 and 203. As a result, according to Goodrich, the new series can be processed and molded into rigid articles with little or no plasticizer. Improved thermoplasticity more than compensates for the lower heat stability of the new materials since high processing temperatures are not necessary.

Geon 205, designed as a rigid molding material requiring no plasticizer, is particularly well adapted to molding phonograph records. Such records, according to Goodrich, possess an extremely low noise level, high fidelity in reproduction, outstanding wearability, and high resistance to breakage. Another interesting application is in the molding of rigid sheeting of the type used in playing cards and advertising novelties.

Adhesive for silicone rubber—A new adhesive expressly designed for bonding silicone rubber to itself and to glass, metals, and ceramics, has been announced by the Chemical Dept. of the General Electric Co. Known as G-E adhesive #12509, the new bonding agent, possessing properties similar to silicone rubber, remains flexible and resilient over temperatures ranging from —70 to 520° F. and withstands continuous temperatures of 300 to 350° F. in a dry air circulating oven, according to its developers. It can also be used to bond glass to glass, glass to metals, and metals to metals.

General Electric reports that the new adhesive has proved especially useful in securing silicone rubber door gaskets directly to oven doors, eliminating the need for clamps and bolts. It is also effective for joining the ends of extruded cured stock to form O-ring gaskets of uniform thickness. Previously these gaskets had to be made by molding the loose ends of uncured stock together in a press, causing one portion of the ring to be smaller than the rest.

FINANCIAL NEWS

Hercules Powder Co., Wilmington, Del., in its 1947 annual report showed net earnings of $12,934,430, and common stock at $4.75 per share. This compares with net income in 1946 of $8,409,843, and $3.03 per common share. Sales increased 30%, and $14,500,000 was spent on new plant facilities. The report states that the company has about completed its original post-war program, and most of the facilities are in operation. The expansion is largely in fields supplying plastic, rayon, protective coatings, and related industries.

Charles A. Higgins, president of the company, advised in his letter to stockholders that the building program in 1948 will be smaller and confined principally to process improvement and savings projects.

Export business of the company in 1947 amounted to $17,000,000, representing 13% of total sales. This approaches the pre-war percentage of 17% of the company's total sales and shows a marked increase over the $7,400,000 exported in 1946.

At the end of 1947, the company had 10,000 employes. Wages and salaries now amount to 26% of sales, which is somewhat higher than the percentage prior to the war when the figure was 24%, the report said.

COMPANY NEWS

Industrial Synthetics Corp., 225 North Ave., Garwood, N. J., has consolidated with its subsidiary, the Beacon Supply Co., Inc., which will operate under the name Beacon Belt Div. The Beacon Belt Div. will continue to manufacture Elastron belts

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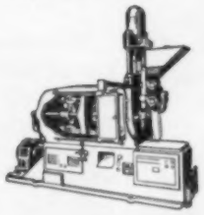

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at Industrial Synthetic's new plant in Garwood.

The Watson-Stillman Co., Roselle, N. J., manufacturers of hydraulic machinery, has appointed H. M. Royal, Inc., 48-14 Loma Vista Ave., Los Angeles, Calif., and Schellenbach Machine and Tool Co., 480 Fifth Ave., San Francisco, Calif., to handle its plastics and rubber molding equipment in California.

Plastics Design and Sales Co., 132 E. Locust St., Newark, Ohio, was recently organized by M. W. Burkhart, formerly president of Newark Plastics, Inc., and William F. Yost, also formerly with Newark Plastics, Inc. The new company engages in plastics product designing and engineering, mold engineering for high and low pressure plastics, consulting on plastic manufacturing technique, and engineering of die casting dies. The company is represented in the East by Jas. H. Savage Associates, 20 Vesey St., New York, N. Y., and in St. Louis, Mo., by J. M. Feehan Co., 5300 Lansdowne Ave.

Midwest Molding and Manufacturing Co. has moved its plant to 4630 W. Fullerton Ave., Chicago, Ill.

Resistoflex Corp., Belleville, N. J., now has available Resistoflex hose made with a tube stock of compar in sizes from 3/16-in. inside diameter up to 1½-in. inside diameter. Maximum recommended working pressures range from 1500 p. s. i. for the 3/16-in. size to 125 p. s. i. for the 1½-in. size.

Compar refers to a group of synthetic resins or elastomers, each of which can be compounded or modified to meet specific requirements.

Heyden Chemical Corp. has purchased the minority interest of the Borden Co. in the American Plastics Corp., Bainbridge, N. Y., for an undisclosed sum and now owns more than 99% of the stock. Simon Askin, assistant secretary and assistant treasurer of Heyden, manufacturers of industrial chemicals and pharmaceuticals, is the new president of American Plastics, succeeding William F. Leicester of the Borden Co.

Esso Laboratories has completed a new research building at the Baton Rouge, La., refinery of Standard Oil Co. of N. J.

With the new laboratory at Baton Rouge, together with others to be completed in Linden, N. J., experimental petroleum facilities of Standard Oil Development Co. will be among the most modern and extensive in the world. The company plans to intensify its research activities in all fields of petroleum.

National Research Corp., 70 Memorial Drive., Cambridge 42, Mass., has developed a continuous process of applying, by evaporation, films of metal to the surfaces of sheet materials. According to the company, this is the first time that continuous application of metal films to continuous rolls at high speeds has been practical. The new process applies extremely thin films of aluminum, silver, gold, and other metals to the surface of papers, textiles, and various plastic sheets at linear speeds of hundreds of feet per minute.

The Industrial Equipment Co., with offices in Buffalo, Rochester, and Syracuse, N. Y., has changed its name to the Tri-Line Corp. The corporation will continue to represent the Watson-Stillman Co.

Luminous Industries, Inc., has been formed to manufacture and distribute luminous compounds and related products, with Erwin Schapira, formerly assistant district attorney of New York County, as president and treasurer. The new corporation will maintain offices, laboratory, and manufacturing facilities at 43 W. 16th St., New York, N. Y., and will manufacture luminous compounds, pigments, paints, adhesives, lacquers, and fluorescent paints and dyes. It will offer business and industry complete engineering and research facilities in the fluorescent field.

The Owens-Illinois Glass Co. has completed transfer of operations of the Toledo, Ohio, Closure and Plastics plant to St. Charles, Ill. The St. Charles property was formerly operated by the Majestic Radio Corp. and was purchased last March by Owens-Illinois. The St. Charles plant is now in full operation on molded caps and custom molded articles and is under the direction of M. Q. Winter, formerly Toledo plant manager.

U. S. Plywood Corp., New York, N. Y., and the Mengel Co., Louisville, Ky., have jointly acquired a two-third stock interest and 50% voting power in Blanchard Deco Plastics, Inc. Blanchard Bros. and Lane, original owners, will hold one-third interest and 50% voting power. The name of the company will be changed to Deco Plastics, Inc., and it will continue to manufacture and distribute decorated vinyl plastic sheeting for upholstery, wall coverings, and industrial use.[1]

National sales headquarters for Deco Plastics, Inc., will be at 55 W. 44th St., New York, N. Y., and the product will be distributed through Flexwood-Flexglass distributors, United States Plywood Corp. distribution branches, warehouses of U. S.-Mengel Plywoods, Inc., and Blanchard Deco Plastics, Inc.

Amercoat Div. of the American Pipe and Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif., has announced a new vinyl coating called Amercoat No. 88, a pigmented vinyl resin dispersed in water, which has no unpleasant odor during or after application.

The high solids content of the new coating produces a thicker film with fewer coats to give greater coverage and better sealing action. It can be applied with a brush or spray gun over concrete, masonry, or wood surfaces.

American Cyanamid has announced the acquisition of the S. T. Dahl Co., Los Angeles, Calif., along with its personnel. Sheldon T. Dahl has been appointed West Coast sales manager for the Industrial Chemicals and Plastics Divs. of American Cyanamid. An office and warehouse have been opened at 2472 E. Eighth St., Los Angeles. The S. T. Dahl Co. formerly acted as sales agent for the Industrial Chemicals and Plastics Divs. of American Cyanamid Co.

The Glidden Co. has contracted with Blaw-Knox Co. in modernizing its Cleveland plant. New equipment will be installed, and a new structure will be designed to house the equipment and provide engineering for the remodeling of existing structures. The new equipment will be used principally in resin production.

Continental Diamond Fiber Co., through Hayden, Stone and Co., has executed a secondary distribution of 20,000 shares of stock at 11½ a share.

Plax Corp. has moved its location to 76 Talcott Road, West Hartford, Conn. The company formerly occu-

[1] "Versatile vinyl sheeting," by W. H. Sheffield. MODERN PLASTICS 25, 94-96 (Feb. 1948).

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pied six different locations in Hartford, with headquarters at 133 Walnut St. At the new location, Plax will occupy 90,000 sq. ft., with all facilities under one roof. The present mail address—Box 1019, Hartford, Conn. —remains the same.

PERSONAL

Dr. Gordon M. Kline, chief of the organic plastics section at the National Bureau of Standards, has been appointed assistant chief of the division of organic and fibrous materials. The Bureau of Standards' announcement says: "Nationally known for his research in such fields as the oxidation of sugar, airplane dopes, polymerization of olefins, and organic plastics, Dr. Kline has been technical editor of MODERN PLASTICS and the editorial director of *Modern Plastics Encyclopedia* for almost 12 years. He was one of the first American scientists to investigate the German plastics and chemical industries."

In 1929 Dr. Kline joined the staff of the National Bureau of Standards, becoming chief of the organic plastics section in 1935. He will continue as chief of that section, in addition to assuming added responsibilities as assistant chief of the division.

Dr. Kline is a member of the Aircraft Structural Materials Committee of the National Advisory Committee for Aeronautics, is chairman of the Federal Specifications Technical Committee on plastics, and vice-chairman of Committee D-20 on plastics of the American Society for Testing Materials.

H. D. Bennett, president of Defiance Machine Works, Inc., was recently acclaimed as one of Toledo's leading citizens and pointed out particularly as one whose efforts had helped develop Toledo's industrial eminence, in a recent story on the city in *The Saturday Evening Post*. His part in developing plastic housings for scales was given as an example of the city's high quality of industrial research.

Harold A. Levey was elected president of the newly formed New Orleans, La., chapter of the Society of Plastics Engineers, Inc. At the same meeting, Ralph W. Chambers was elected vice-president, and Paul F. Oswald, secretary-treasurer.

Edwin T. Kaiser is the new production manager of U. S. Fiber & Plastics Corp., Stirling, N. J. Mr. Kaiser was previously associated with the Western Electric Co. and with the Essex Electonics Co. U. S. Fiber fabricates various consumer items from flexible plastic sheeting by an electronic welding process.

William Kops has been appointed sales manager for Decorative Panelyte, and D. F. Sweet, sales manager for Industrial Panelyte within the Panelyte Div. of St. Regis Sales Corp. The organization has announced a program of broader responsibility in the Panelyte Div., made necessary by a large increase in volume of business. Mr. Sweet will also be in charge of Panelyte's New York office. J. T. Murphy succeeds Mr. Sweet as Trenton District manager.

Charles C. Convers of Panamerican Plastics Co., Dallas, Texas, was elected president of the newly organized North Texas Section of the Society of Plastics Engineers, Inc. At the same time, Lou Barnett of Loma Plastics, Inc., Fort Worth, Texas, was elected vice-president; Harris Brim, Modern Plastics Co., Dallas, secretary; and E. H. Swazey, Lone Star Plastics Co., Inc., Fort Worth, treasurer.

Commander Dan Bloxom of Southwestern Plastics, Inc., Houston, Texas, was elected president of the newly formed South Texas Section of the Society of Plastics Engineers, Inc. Marion Arthur of Humble Oil and Refining Co., Houston, was elected secretary.

James T. Growley of the Plastics Div. of Celanese Corp. of America, has been elected president of the Newark Section of the Society of Plastics Engineers.

Charles F. Hamilton has been named district sales manager of the territory comprising western New York State, western Pennsylvania, and northeastern Ohio, for Kurz-Kasch, Inc., Dayton, Ohio. Mr. Hamilton was in charge of the Kurz-Kasch sales office in the Detroit, Mich., area from 1938 to 1945.

Joseph J. Hart, who recently resigned as divisional sales manager for Magicolor Co., Chicago, Ill., has been appointed general sales manager of Adhesive Products Corp., with headquarters at 1660 Boone Ave., New York, N. Y.

Malcolm McVickar, formerly manager of domestic merchandising for the Spool Cotton Co., has been appointed general sales manager of Commonwealth Plastics, Inc., and will supervise sales, advertising, and merchandising activities.

Crawford H. Greenewalt became the 10th president of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., following the January meeting of the Board of Directors. Walter S. Carpenter, Jr., who resigned as president, was elected Chairman of the Board, following the retirement of Lammot du Pont from the latter post.

The new president has been with the company since 1922 when he started as a chemist in the Philadelphia works.

George P. Anderson, formerly president of Badger Plastics, Inc., Sheboygan, Wis., and widely known in the plastics field, has been made Director of Plastic Machinery Div., Defiance Machine Works, Defiance, Ohio.

The Badger Plastics extrusion division has been sold to the Defiance Machine Works, Inc., and the injection division of the company has been sold to the Plastics Engineering Co. of Sheboygan, Wis.

Jacob A. Kempf has been appointed sales engineer for the R. W. Kerr Plastic Co., Hastings, Neb.

Meetings

March 28-30—Pacific Coast Section, S.P.I. 1948 Conference. To be held in Santa Barbara, Calif., with headquarters at Santa Barbara Biltmore Hotel.

April 26-30—Annual Packaging Exposition, Public Auditorium, Cleveland, Ohio.

May 20-21—Annual meeting of the Society of the Plastics Industry, Hotel Ambassador, Atlantic City.

Sept. 27-Oct. 1—Third National Plastics Exposition, Grand Central Palace, New York, N. Y.

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WANTED: PLASTIC Scrap or Rejects in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

FOR SALE

Hydro Pneumatic Accumulator, 13 Gal. 3000#. 25 Ton "C" Frame Type. High Speed Self Contained Hyd. Press —300 ton New Hobbing Press with Pump—Racine Pumps, Boosters, Valves, Logan Pumps, Valves. Self-Contained.—200 H.P. 78 Gal. 3000# Pump. 200 H.P. 200 Gal. 1500# Pump 18" x 15' Accumulator 1500#.—15" x 11' Acc. 400-2000". 6" x 9' Accumulator-2000#. 300 Ton Press 20" Ram. 8" Stroke. 24" x 20" Platen. 500 Ton—1000 Ton Hobbing Press—Hele Shaw Variable Pressure 33 GPM 2500#—Vickers Oil Pumps 17 GPM 500 to 1000#. Elmes Horo. 4 Plunger 6—Gals. 5000#.—Stillman 12" x 12" Laboratory Presses. Aaron Machinery Co. 45 Crosby St., NYC.

DO YOU NEED a Hydraulic Press for Compression Molding, Transfer Molding, Laminating, Forming, Bending, and Hobbing? Many sizes hydraulic presses and pumping units available. New motors from 2 to 7½ H.P., 220 volts, 3 phase. Whatever it may be, if it is hydraulic, see Sal-Press Company, 388 Warren Street, Brooklyn, N. Y.

FOR SALE—1—Watson Stillman Hydro-Pneumatic High and Low Pressure System, complete with pumps, tanks, boilers, etc., for 3000# operation. 2—Baker Perkins 100 gallon Plastic Mixers. 1—12" x 12" Press 7" Ram. Steel Heated Platens and Hand Pump attached; 1—24" x 24" Adamson, 10" ram, 2-opening Hydraulic Press; 1—24" x 24" Farrell 10" ram, 2-opening Hydraulic Press; 1—30" x 30" D&B, 2-open, steel heated Platens 12" ram; 2—LaPointe Hydraulic Pumps, 150 G.P.M.—2000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press 9" ram; 6—Hydraulic Presses, 20" x 20", 12" x 14"; Dry Powder Mixers; Pulverizers, Grinders, etc. Send for complete list. Reply Box 1545, Modern Plastics.

HYDRAULIC SERVICING

Hydraulic installations—repairs modifications and hydraulic power units built to specifications by hydraulic specialists.

Hydraulic Service Company of N.Y.
4317 Richardson Ave., Bronx 66, N.Y.
Telephone: MUrray Hill 2-0276

FOR SALE—Plastic Advertising and Novelty Manufacturing business, including thirty-five sets of compression molds and stamping dies. Good business for a hustler. Equipment now located in Chicago can be moved to any other city or town. This is an unusual opportunity. Reply Box C558 Modern Plastics.

FOR SALE: Angle Molding Hydraulic Press Watson-Stillman, suitable for Split Molds and for Molding Complicated Parts by the transfer method. 3 horizontal double acting rams, 13½", 8" and 6" arranged in "T". Reply Box C132. Modern Plastics.

WANTED
EXPERIENCED EXTRUDER REPRESENTATIVE

By growing, progressive manufacturer. Straight liberal commission. Territories fully protected. Allied, non-competing lines and engineering background an asset. Write in detail, confidentially, experience, established contacts, etc. Box 82 Roselle, New Jersey

HYDRAULIC PRESSES, 30"x52", 24" ram, 700 tons; 30" x 30", 20" ram, 1000 tons; 30" x 30", 17" ram, 340 tons; 20" x 24", 19" ram, 350 tons; 42" x 42", 16" ram, 250 tons; 36" x 36", 16" ram, 250 tons; 36" x 36", 12" ram, 141 tons; 36" x 52", 14" ram, 385 tons; 26" x 30", 15" ram, 177 tons; 20" x 20", 13" ram, 166 tons; 24" x 26", 10" ram, 118 tons; 19" x 24", 10" ram, 78 tons; 23" x 17", 8" ram, 75 tons; 22" x 15", 8" ram, 75 tons; 15" x 15", 8" ram, 75 tons; 12" x 12", 7½" ram, 50 tons; 12" x 12", 6½" ram, 42 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½" ram, 12 tons; New Dual Pumping Units; HPM Triplex 1½ GPM 2500#, Robertson Duplex 1-2/3 GPM 4000#; Worthington 2⅛ GPM 4000#, W&S Duplex 1 GPM 2500#, 4 plunger 6 GPM 2000#; Laboratory Presses all sizes; Laboratory Mills, New Units 6" x 12" M.D., 10" x 24" and 16" x 30", 36", 40" and 42" Mills with Drives; Extruders, Plastic; NRM 1½" and 2½" units; W&P unjacketed sigma blade 100 gal. Mixer; Preform Machines; Stokes R, Colton 5T; Hydro-Pneumatic and weighted type Accumulators, etc. HIGHEST PRICES PAID FOR YOUR USED MACHINERY. Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13.

WANTED
MANUFACTURER'S REPRESENTATIVE

By reputable midwestern extrusion concern with excellent production and development facilities. Some experience and contacts essential. Commission basis. Give complete details in reply. Box C559, Modern Plastics.

FOR SALE—HYDRAULIC PRESSES
1—Watson-Stillman 225 ton, 30" x 28" platen, 16" ram; 3—Southwark 225 Ton, 31" x 19" platens, 16" ram; 1—Burroughs 150 ton, 28" x 13" platens, 2-9" rams; 2—Baldwin-Southwark 110 ton, 24" x 18" platens, 11" ram; 3—Watson-Stillman 60 ton, 12" x 12" platens, 8" ram; 1—12 ton, 15" x 15" platens, 3½" ram; 1—HPM Hydro-Pneumatic Accumulator, 650", 4' 6" x 12' tank with IR 30 Compressor; 2—Steam Driven Hydraulic Pumps, 15 and 30 GPM, 3000# and 5000#; 1—Baker Perkins 100 gal. jacketed double arm Mixers; 25—Stokes Preform Presses "R", 2½"; "T", 1½"; RD4 Rotary, 1"; Colton Rotary, 25 punch, ¾"; Day Readco, from 4 to 150 gal. double arm Mixers; 2—Ball & Jewell #0 and #1 Rotary Cutters. BRILL EQUIPMENT COMPANY, 225 West 34th St., New York 1, N.Y.

MOLD FOR SALE—4-cavity injection mold for toggle switch plates. Fits 8 oz. Lester or 9 oz. HPM. Mold is slightly used and in excellent condition. Available for export or domestic use immediately. Price $1000. Reply Box C560, Modern Plastics.

2 **COLTON** 10-35 Rotary Preform Machine. Like new, equipped with 7/16" & 5/8" punches and die, 3 h.p. motor. Will accept best offer. Reply Box C561, Modern Plastics.

WANTED: 4-6 or 8 oz. used Reed-Prentice injection machine. Must be 1947 model. Prefer one used about 6 months or less. Write full details and price. Uncas Manufacturing Company, 623 Atwells Avenue, Providence, R.I.

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MOLDS WANTED for advertising specialty or stationery products. Furnish complete details. Reply Box C562, Modern Plastics.

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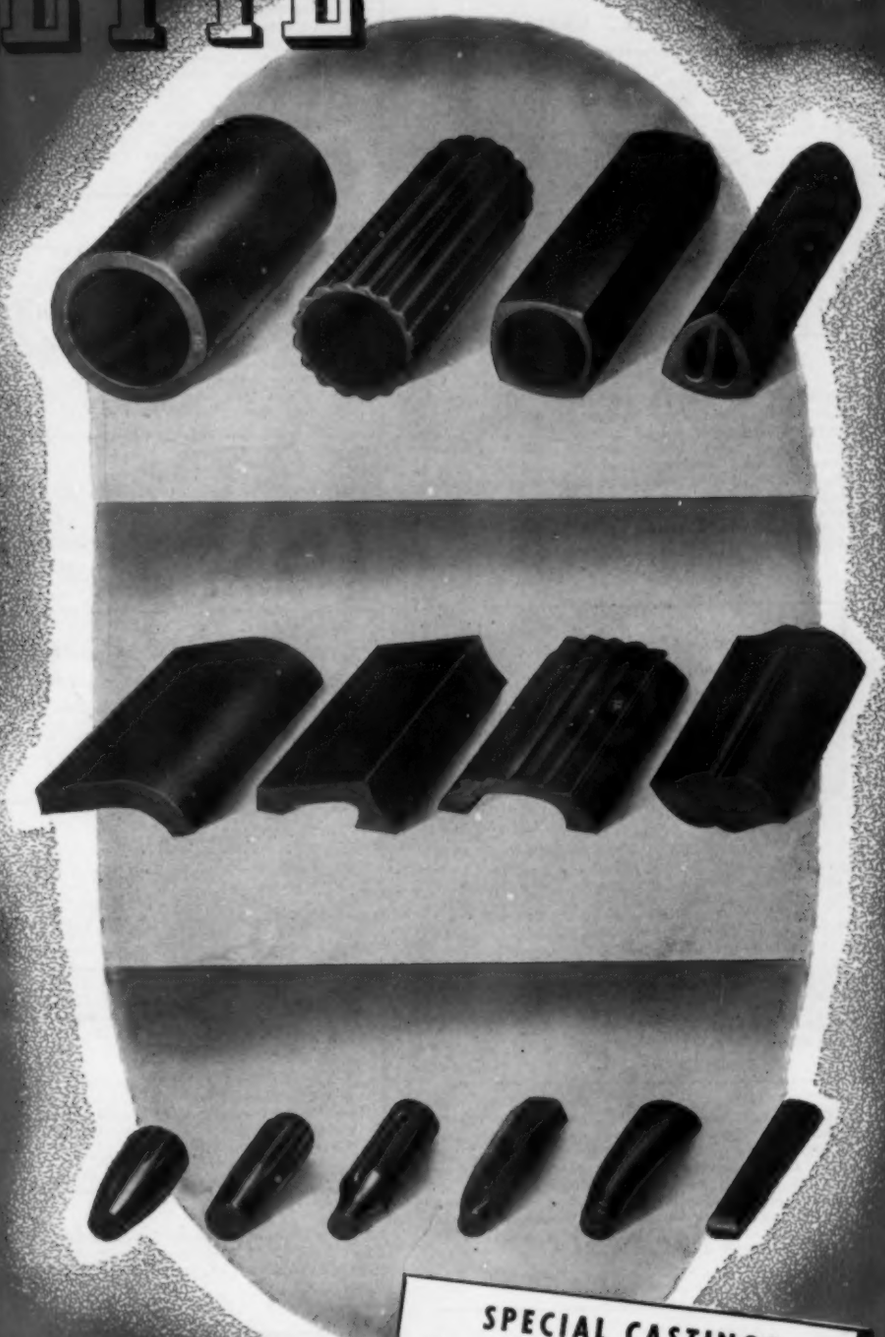
A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

MARBLETTE



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Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

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SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

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Manufacturers of Phenolic Resins since 1929

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FOR SALE—excellent new injection molds, producing inexpensively good quality animal toys for the Toy and Nursery trades. These multi-purpose molds, complete in themselves, are capable of being used as a basis for other toys because of their interchangeability. Reply Box C569, Modern Plastics.

MOLD DESIGNER - DRAFTSMAN

Compression, Transfer molds, knowledge methods of finishing and machining molded parts desirable. Our firm small, progressive, long established, located central New York State. Our Plastics Division is one of several and our diversity of products makes for stability of employment. Group Insurance, holidays, paid vacations, etc. further make this position attractive. Housing available. Please write stating age, education, experience, wages desired and other pertinent information to Box C563, Modern Plastics.

FOR CALIFORNIA MANUFACTURERS: Advertising Manager, currently with one of largest Eastern manufacturers, coming to California—can be available to you soon. He has a broad and comprehensive experience in industrial and consumer plastics advertising. If you need aggressive, dollar-smart advertising, write for samples and free "successful-promotion" history. $6,500. Reply Box C564, Modern Plastics.

PLANT MANAGER—Ambitious man who can take full charge of plastic sheeting plant. Thoroughly experienced in plant management. Excellent opportunity. Write box 523, Suite 617, 1457 Broadway, NYC.

CHEMICAL ENGINEER—MCHE, Age 29, Married, SPI Aiche Member, 9 years diversified research laboratory, plant, sales experience with large plastics mfgr. Thoroughly familiar mfg. processes, all types of molding (published paper), fabrication, mold, article design, testing (SPI Committee), sales presentation, plastics consultant. Supervised large group successful field evaluation new plastic now large scale production. Highest references. Available February 1, 1948. Reply Box C565, Modern Plastics.

FOR SALE: brand new injection type Molds One 6-cavity combination special designed beautiful Soap-Box, one 6-cavity Soap-Dish and one 4-cavity tumbler Mold. All three Molds to fit the 8-ounce Reed-Prentice or any other injection machine. Molds are brand new and in perfect working conditions for immediate possession. Reply Box C566, Modern Plastics.

SALES ENGINEER WANTED—Experienced man wanted by well established New York City extrusion house. Capable salesman will be backed by first class production and well seasoned experimental department. Reply stating qualifications. Box C509, Modern Plastics.

STOKES MOLDING PRESSES—Liquidating 1-50, 2-150, 1-200 ton semi-automatic compression presses, all in excellent operating condition. Reply Box C567, Modern Plastics.

NEED SPACE BADLY—MUST SELL —MAKE OFFER

Complete compression molding department consisting of one 200 ton semi-automatic press, 16" ram—One 14" ram semi-automatic molding press approximately 150 ton—One 12" ram semi-automatic molding press approximately 100 ton—One 8" ram semi-automatic molding press approximately 70 ton. Also weighted accumulator, pumps, compressors and all other equipment necessary for operation. Reply Box C568, Modern Plastics.

PROMINENT MEXICAN molder will manufacture and distribute your products in Mexico. Lester-Phoenix 6 oz. injection and numerous compression presses available. Will buy or rent suitable molds. Any reasonable proposition considered. Write Industria Metalica Mexicana, S.A., Apartado No. 1822, Mexico D. F. Mexico.

FOR SALE—2—Thropp 2-roll rubber mills, 16" x 42", with gear reducers.
20—American Tool Rubber Cement Churns, 200 Gallons. Reply Box C570, Modern Plastics.

WANTED—Dressing comb molds having either all fine teeth or all coarse teeth. Advise price, description and condition. Reply Box C571, Modern Plastics.

FOR SALE—1—200 Ton Press, 24" x 32", 9" Ram Watson-Stillman single action; 1—150 Ton Press, 23" x 28", 7" Ram Watson-Stillman single action; 1—Watson-Stillman Hand Action Jack; 1—6C-4977, 30 G.P.M. Racine Pump, new; 1—Model 135-8 Jones Grinder. Reply Box C573, Modern Plastics.

WANTED

Injection mold for manufacturing poker chips. Please state number of cavities, condition of mold, and include sample or drawing. Reply Box C572, Modern Plastics.

FOR SALE—600# Bakelite BM-5887 Briar Flow 90; 1550# Monsanto Resinox 8282C Black 5118 Flow 11. Reply Box C574, Modern Plastics.

WANTED: PLASTIC ENGINEER position will require man with experience in estimating mold & tool costs, molding & finishing operations, to be able to supervise tool design & competent to act as assistant to the chief engineer. Reply Box C575, Modern Plastics.

WANTED: Plastics fabricator to take complete charge of fast growing plant. Must have experience in fabricating and vacuum forming of acrylics during the past two years. Housing location assistance given. Write giving complete information including references to Plastics Productions, Inc., 1002 Pauger St., New Orleans 16, La.

WANTED: New or used dies or moulds for any articles of any design suitable for 1-oz. Van Dorn Injection Moulding Machine.

2-oz. Watson Stillman vertical Injection Moulding Machine.

Send particulars, photographs, prices to Mayco Chemical Co., 5 Union Square W., N.Y.C. 3, N.Y.

FOR SALE: Complete or half of an Injection Molding plant, now in operation, located in the New York City area. $40,000 or $20,000. Write C576, Modern Plastics.

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available for
distributing
Plastic Products
and allied items
Nationally

P. O. Box 1248
Akron, Ohio.

AVAILABLE—Adhesive chemist B.S. Age 36, experienced in urea-formaldehyde, phenol-formaldehyde, and resorcinol-formaldehyde synthetic resin adhesives & laminating varnishes. Capable of setting up complete adhesive manufacturing equipment & supervising development, control, and research. Also experienced in field & technical service work. Reply Box C577, Modern Plastics.

PRODUCTION CHEMIST—with experience in the manufacture of Phenolic moulding powder. Must have ability to supervise men and get production results. Excellent opportunity for right man. Plant located in Middle West. Reply Box C507, Modern Plastics.

MACHINERY WANTED—One #2 Simpson Muller, 6 ft. diameter—preferably jacketed. Write Kolmar Laboratories, Milwaukee 2, Wisconsin giving full details.

FOR SALE

A new 8 cavity wall tile mold, 4¼ x 4¼ x 16 for 8 oz. Injection Molding Machine or over. Also 4,000 lbs. Cellulose Acetate Molding Powder. Sacrifice for fast buyer. Call: . . .

Mr. Karp — CHickering 4-1162

FOR SALE—1—#1 Royle (2" diameter) Extruding Machine with 9 K. W. Hot Oil Heating Unit—Machine never used. Slater Brothers, Inc., 460 Totowa Avenue, Paterson 2, New Jersey. LAmbert 5-1880-1

RESEARCH DIRECTOR, trained in plastics and rubber, for Abrasive Company in New England. Excellent opportunity for young man with development and organization ability. Reply Box C578, Modern Plastics.

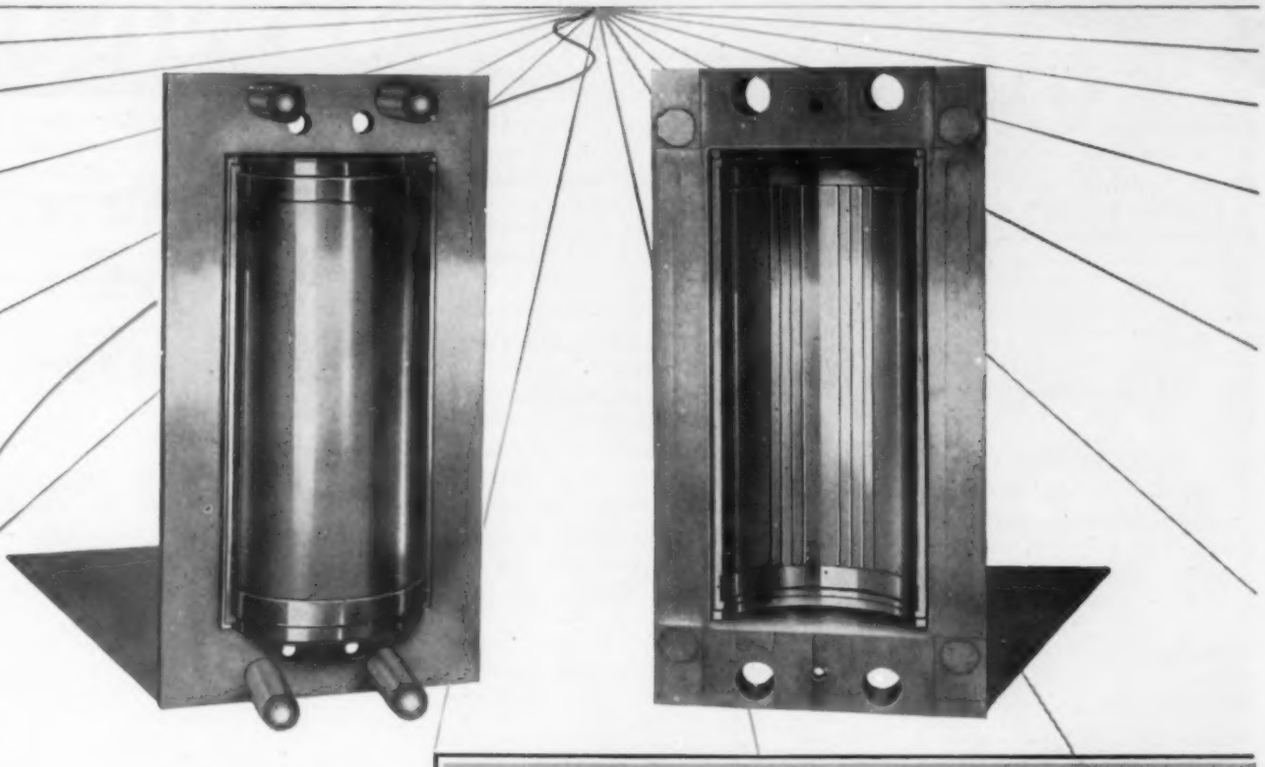
FOR SALE—PLASTIC SHEETS

Having discontinued manufacturing plastic toys, we offer a quantity of sheets at sacrifice prices. Various sizes.

American Wood Products Company
Box 347
Chippewa Falls, Wisconsin

SALES ENGINEER wanted to solicit business in Eastern Massachusetts, New Hampshire, Vermont, and Maine for extruded nylon rod and strip. Office facilities available Boston. Reply Box C579, Modern Plastics.

Finish, Accuracy in Plastic Molds



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PROVED!

...for fast, accurate molding!

-the new DeMattia Injection Presses

The fact that DeMATTIA Molding Presses and Molding Equipment are specified year after year, by molders throughout the world is proof of their dependability. One sure way to better plastic production is the specification of DeMATTIA machines and DeMATTIA molds in your plant.

Rugged Hydraulic Horizontal Press—

An efficient DeMATTIA press featuring proper design, finest workmanship and materials and built to function smoothly in heavy, continuous service. Solid base and tension members, open feed for visual inspection and fast, contamination-free color changing are only a few of the many advantages. Available in 6, 12 and 24 ounce capacities.

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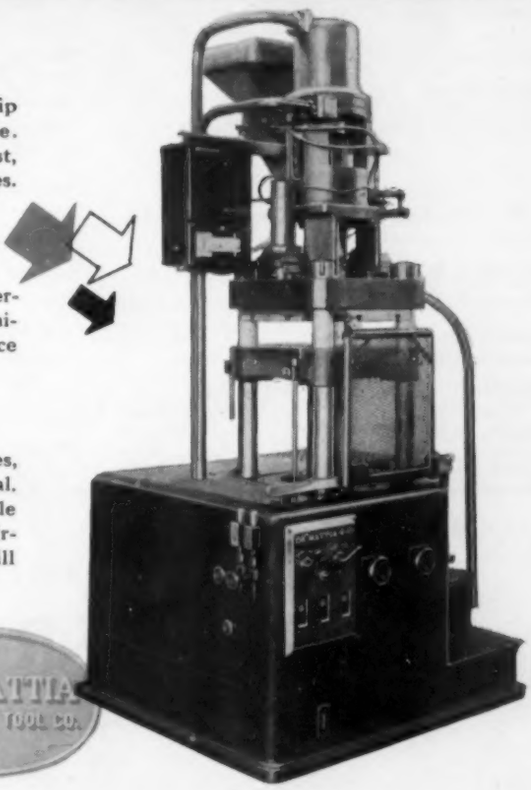

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A BRESKIN PUBLICATION

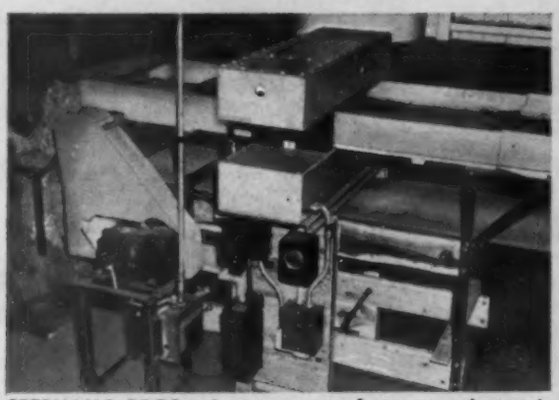
MODERN PLASTICS

Published by MODERN PLASTICS, INC.
122 East 42nd Street New York 17, N. Y.

Stray Metal can't pass this electronic watchdog

VICKS COUGH DROPS pass through this RCA metal detector *after* packaging . . . last of a series of controls on product purity.

THIS WHEATENA metal-detector installation is continuously on duty . . . safeguards quality of this popular breakfast food.



STEPHANO BROS., cigarette manufacturers, electronically inspect leaf tobacco . . . report that the metal detector paid for itself the first month.

KAYE-TEX MFG. CO., plastics manufacturers, use the metal detector to inspect plastic sheets . . . protect calender rolls. Speed: 115 feet per minute.

RCA's Automatic Metal Detector provides final check on product purity

TYPICAL of the precautions taken by industry to assure 100 per cent protection to its customers are these installations of RCA's metal detector.

Such equipment helps eliminate the last element of chance from product inspection—is assurance against the possibility, however rare, that a bit of stray metal might accidentally get into your product.

These metal detectors are placed in the regular production line . . . can spot particles as small as 70 thousandths of an inch in diameter at conveyor speeds *up to 600 feet per minute.*

The material passes through the metal detector's aperture. *Any* metal or alloy . . . magnetic or nonmagnetic . . . even if deeply embedded, causes the detector to act instantly.

The action can stop the conveyor . . . sound an alarm . . . reject contaminated packages or bulk goods automatically . . . or mark the material for later removal.

This RCA development provides a final check on conventional visual and mechanical inspection methods. It safeguards product quality . . . preserves customer good will. And . . . if your product passes through valuable processing machinery, you prevent costly repair bills.

Full information on the RCA electronic metal detector is now available. Write Department 61-C.

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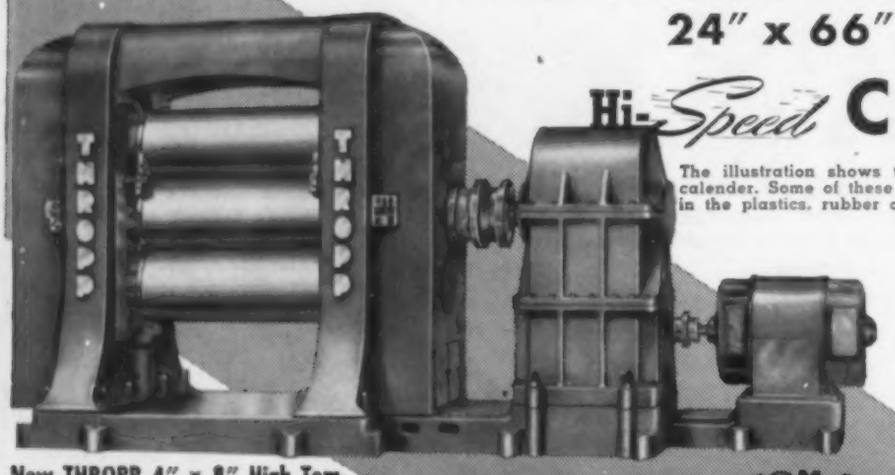
MANY NEW FEATURES IN THIS THROPP
24" x 66" - 3 ROLL
Hi-Speed CALENDER



The illustration shows the new Thropp 24" x 66" 3-roll high speed calender. Some of these calenders are now under construction for use in the plastics, rubber and adhesive plaster industries. The important features of this unit include self-aligning roller bearings on the roll necks and vertical enclosed herringbone speed reducer driving direct to middle roll eliminating the master gear and pinion. Equipped with completely enclosed and self-contained lubrication system for roll neck bearings which will withstand exceptionally high temperatures and designed with oil seals that give complete protection against oil leakage at very high roll operating temperatures.

There are also many other new features which have been incorporated into the roll adjustment mechanism.

New THROPP 4" x 8" High Temperature Precision Laboratory Mill.

Illustrated is a photograph of a recently completed laboratory mill for a large Eastern chemical manufacturer.

It was designed to suit the customer's requirements for a precision built, high operating temperature mill. The important features of this mill are self-aligning roller bearings on the roll necks, enabling the use of exceptionally high roll surface temperatures.

To provide simplicity for this unit, a direct drive to the fixed roll was arranged from a General Electric gear head motor through a flexible coupling. Lubrication of roll neck bearings is accomplished by a completely enclosed circulating system, leakage of which is prevented at the roll necks of a mechanical type oil seal.

Guides are of the swing-up, easy cleaning type.

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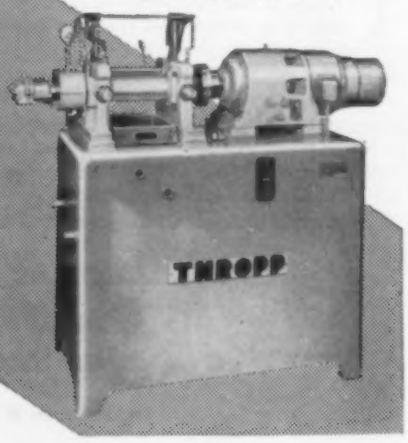

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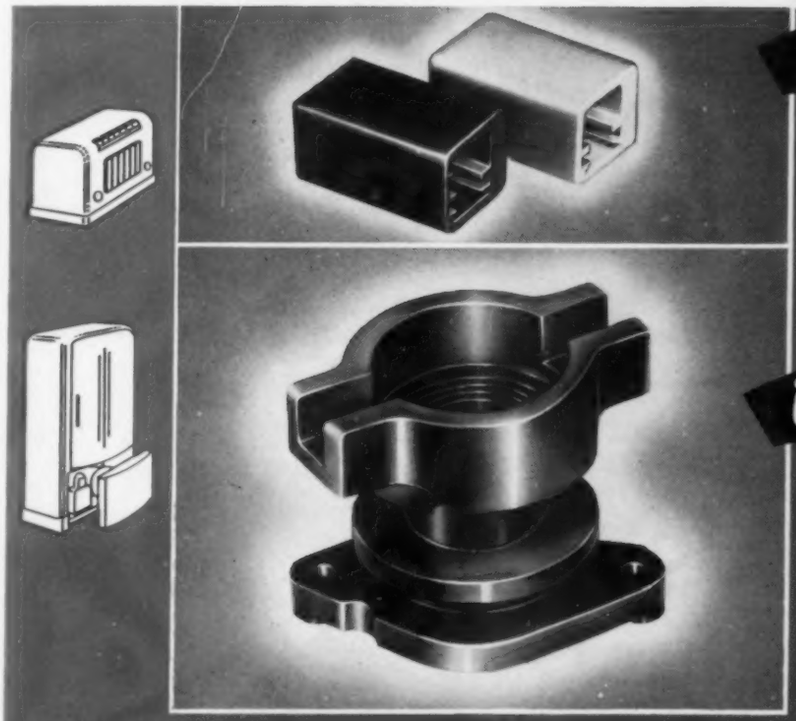

simple

Push buttons for an auto radio — decorative, colorful, pleasant to the touch — not, strictly speaking, functional parts, but at P R P they receive the same detailed attention that is given to complicated, close tolerance parts.

intricate

Westinghouse Electric Corporation requires unvarying precision in the production of this hermetically sealed refrigerator motor relay housing. P R P supplies this transfer molded part, holding well within the ± tolerance of .002 in.

Here are two widely diverse examples of P R P plastic parts production—one comparatively simple, the other extremely intricate, allowing no deviation in any dimension. Both of these parts . . . and scores of others produced for some of the nation's leading manufacturers . . . are custom molded by P R P, *with delivery geared to the customers' production schedule.*

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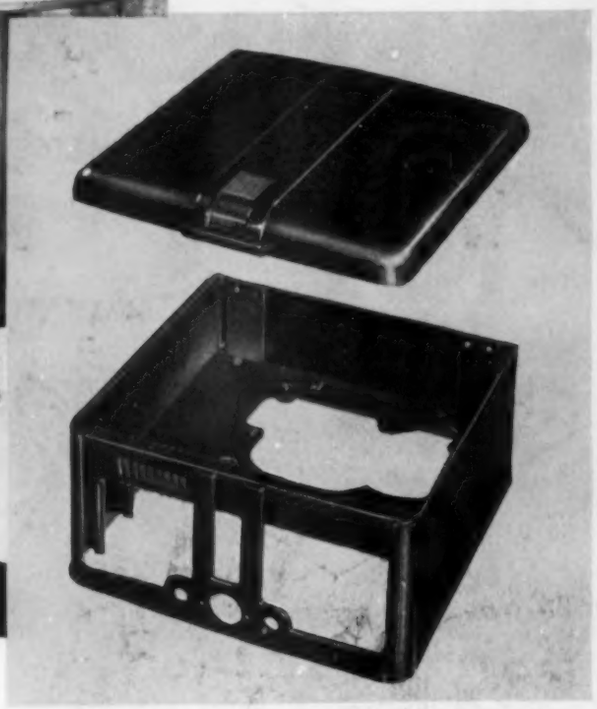

Motorola solves its housing problem!

And solves it brilliantly! Because not only is this top-quality, high-fidelity radio-phonograph housed with *beauty*, with *durability*, with *economy*—but the housing itself plays a big part in the design of the instrument.

Lugs and bosses are provided for the quick, easy, permanent installation of the various components. Waste space is eliminated Strength is provided where strength is needed. Finishing is largely eliminated... even *color* is an integral part of the material.

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